AUSTRALIAN
Personal Computer

AUSTRALIA'S LEADING MICRO MAGAZINE

ISSUE No. 5 $1.95

UNIQUE INTRO FOR THE NEWCOMER

ZX80 DOUBLE FIRST
Sinclair makes it, APC tests it

¼ million people made their first computer purchase from us.

We are ComputerLand, the number one retailer of small computers in the world.

Why did so many people join the ComputerLand team? Because, like you, they wanted to buy their first computer from a specialist; from someone who cared about their satisfaction.

We at ComputerLand carry the widest selection of small computer equipment available in Australia.

Micro•computers, printers, V.D.U.'s, synthesisers and software, all at price you can afford too.

Our courteous sales and service staff can configure a computer system to your specifications, and in many cas deliver it to you that same day.

So, don't limit your options. Come to ComputerLand today and join the number one team. We're expanding the way your world thinks.

Adelaide — 131 PIRIE STREET PHONE 223 5083
Brisbane — 127 CREEK STREET PHONE 221 9777
Melbourne — 555 COLLINS STREET PHONE 62 5581
Perth — 197 ST. GEORGES TERRACE PHONE 321 4671
Sydney — 55 CLARENCE STREET PHONE 29 3753

ComputerLan

© CLA Sydney July 1980

CONTENTS

Volume 1, No.5 September 1980

3 NEWSPRINT
Miriam Cosic brings you the latest news in her usual style.

5 YANKIE DOODLES
The latest US developments from Tom Williams.

8 BENCHTEST
The Sinclair ZX80 . . . David Tebbutt conducts Australia's first in depth appraisal.

15 MARKETING STRATEGIES OF MICRO MANUFACTURERS.
Dr Jon Patrick casts a critical eye.

19 FACE TO FACE
Is your computer friendly? David Hebditch on the man/machine interface.

22 COMPUTER GAMES
More complex evaluation functions – David Levy continues his series.

27 COMPUTER ANSWERS
Sheridan Williams and his team answer your queries.

28 GATEWAYS TO LOGIC
Continuing Derek Daines' unique series on teaching microcomputing to others. This month he looks at Bookean Algebra.

31 MICRO CHESS
A brief history of chess programming.

32 POWER POINTS
A two part feature on the subject of power supplies – including a typical circuit diagram.

37 THE COMPLETE PASCAL
Control Structures II.

42 BACK ISSUES
Find out what you missed!

43 BOOKFARE
The politics of IT researched and written by Malcolm Peltu.

45 COMMUNICATION
Our readers in their own write.

46 FAX

46 LEISURE LINES
J.J. Clessa has a second palindromic brain teaser for you.

46 USERS GROUP INDEX
More updates.

47 WHISTLING UP COLOUR
R.W. Lawrence gives sinusoidal instructions for Apple "hands off" control.

52 PROGRAMS
Get those fingers tapping on our readers' latest listings.

56 NEXT MONTH'S PREVIEW/ ADVERTISERS INDEX

In store will return next month.

Australian Editor
Sean Howard
Editor
David Tebbutt
Deputy Editor
Peter Rodwell
Executive Editor
Bruce Sawford
Advertisement Manager
Marie Pirotta
Advertisement Assistant
Josephine McKenna
Production Manager
Michael Thomas
Typesetting
Pam Typesetting
Jane Hamnell
Printed by
Nunawading Press
London Editorial Office:
Sportscene Publishers (PCW) Ltd.,
14 Rathbone Place,
London, W1P 1DE,
Tel: 01-637 7991/2/3
Telex: 8954139 A/B 'Bunch' G.
London
London Advertisement Manager
Stephen England
(01-631 1786)
Consultants
John Coll, Mike Dennis,
Miriam Cosic, Michael James,
David Hebditch, Sheridan
Williams, Dr Adrian Stokes,
Dr Stephen Castell.

Published by *Australian Microcomputer Journal Pty. Ltd.*,
P.O. Box 115, Carlton,
Victoria, 3053.
Telephone: (03) 82 5783.
Telex: AA30333.
P.O. Box 250,
North Sydney, N.S.W. 2060.

Produced in Australia
under licence from *Felden Productions Ltd.*, England.

Subscription Rates:
Australia $24.00 for 12 issues, New Zealand $30.00 for 12 issues (surface mail). Prices include postage and packing. Supplies to specialist shops can be arranged by negotiation direct with the publishers.

Cover Illustration
Ian Dobbie.

Distributed by
Gordon & Gotch (A'asia) Ltd.,
MELBOURNE, SYDNEY.

Copyright Notice
All material contained within *Australian Personal Computer* is protected by the Commonwealth Copyright Act 1968. No material may be reproduced in part or whole without written consent from the copyright holders.

APC welcomes all unsolicited material (written, photographic & illustrative) and, although no guarantee can be given as to its safe return, reasonable care and attention will be exercised.

Guidelines for Contributors
APC welcomes articles of interest. Don't be put off if your style of writing is "under developed" . . . true worth lies in the content, and shaping features comes naturally to us! Manuscripts should not exceed 3,000 words and authors are asked to use triple spaced lines with a wide left-hand margin; diagrams, listings and/or photographs should be included wherever possible. Please enclose a stamped, self-addressed envelope if you would like your article returned.

Because of the foregoing, it is necessary to add that the views expressed in articles we publish are not necessarily those of *Australian Personal Computer*. Overall, however, the magazine will try to represent a balanced, though independent viewpoint. Finally, before submitting an article, please check it through thoroughly for legibility and accuracy.

Registered for posting as a Publication—Category B

archives

the price breakthrough in performance business computers.

Success in today's business world demands efficiency and financial accuracy. But the ever -increasing cost and comlexities of doing business are forcing you to find new ways to cut labour cost as well as gain tighter control over your business.

The ARCHIVES BUSINESS COMPUTER can give you the control you need to be successful, all in one economical desk-top cabinet.

The ARCHIVES BUSINESS COMPUTER can do your daily business functions such as accounts receivables and payables, general ledger and inventory control. It can keep track of stock on hand, stock on order, and supplies to be ordered. As a Word Processor the ARCHIVES BUSINESS COMPUTER can do your correspondence, text editing of manuals, contracts and proposals. The ARCHIVES BUSINESS COMPUTER can do virtually any information handling or record keeping operation you are presently doing plus many desirable operations that cannot economically be performed by manual methods.

The Archives disk storage can reduce entire filing cabinets to convenient 5¼ inch disks and instantly retrieve any information that you may need when you need it.

Sound incredible? The ARCHIVES BUSINESS COMPUTER is that and more!

It's a business assistant. One that never forgets, never loses reports, makes efficient use of its time and is completely trustworthy.

The ARCHIVES BUSINESS COMPUTER is also easy to work with. So easy in fact, it's no more difficult to operate than any other office machine. While the ARCHIVES BUSINESS COMPUTER is handling the extra work load, you can have more time to develop new business in the field.

There is no question that the major area restricting your business growth is in the office. This is one place where employee efficiency is still in the dark ages -requiring the handling of paper, forms and files. What you really need is not the physical presence of obsolete forms and letters, but the information and data they contain. You need the Archives Business Computer.

The Archives Business Computer offers you an economical way to individualised computing power. You can take it anywhere there's work to be done. Plug it in, turn it on, and it's working for you giving you instant access to the information you need.

Designed especially for a small business or single department in a large corporation, the Archives Business Computer is a system you can understand and use with a high degree of efficiency without being a computer specialist.

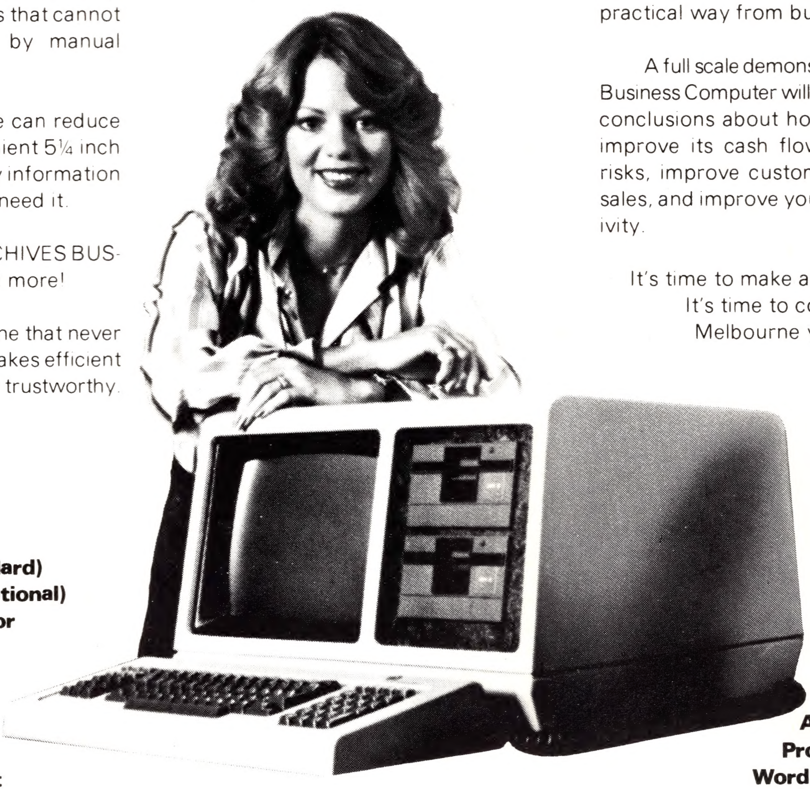
Incorporating quality and reliability the Archives Business Computer provides you with today's and tomorrow's best value in a computer system. The Archives Business Computer is a system to help your business grow.

The Archives Business Computer is backed by competent and qualified technical support for both equipment maintenance and software aid as well as continuing personalised service.

One of the best investments you can make in this inflationary economy is the Archives Business Computer. In fact, virtually every business enterprise can benefit in some practical way from business computing.

A full scale demonstration of the Archives Business Computer will help you draw positive conclusions about how your business can improve its cash flow, reduce costs and risks, improve customer service, increase sales, and improve your employee productivity.

It's time to make a move for the future.
It's time to contact Computerland
Melbourne your Archives dealer.



FEATURES
Z80 4MHz Processor
64 K RAM Standard
744K Bytes Storage (Standard)
1½ Megabytes Storage (Optional)
12" Green Phosphor Monitor
25 Lines x 80 Display
CP/M Operating System
Selectric Style Keyboard
S100 Expansion Inbuilt
Microprocessor Keyboard
240 x 100 Graphics Format
Numeric Keypad and Function Keys.

SOFTWARE
Microsoft Fortran
Microsoft Basic
Microsoft Cobol
General Ledger
Stock Control
Mail List
CBasic 2
Accounts Payable
Accounts Receivable
Property Management
Word Processing System
Microsoft Basic Compiler

ComputerLand®
in Melbourne

archives

555 Collins St. •Melbourne, Vic. •Australia 3000 Phone 62 5581 •62 6737 •Telex AA37007

'Allo, allo, allo!

A young Australian company, Electro Med, is designing and manufacturing equipment for the transmission of medical and computer data via the standard telephone system.

Established eight years ago making cardiac communications equipment, the company has developed into designing a comprehensive range of acoustic modems. The company has worked with Telecom in the formulation of regulations covering the use of acoustic modems at each end of the data connection. Which is comforting for those of us who want to stay on the right side of the law without hassling on finer points. (Have you seen the ad. for another product which by means of sexist advertising par excellence manages to obscure with bathing beauties a printed message that boils down to the fact that as far as Telecom is concerned the whole thing is illegal?)

Anyway, the point is that Electro Med has released its new 700 series acoustic modems. They are modular, allowing individual tailoring. The 700 Full Duplex operates at up to 300 BPS and is directly plug compatible with the Teleray 43, Digital LA34 and the new GEC TermiNet 2030.

It derives power from the terminal via the interface connector, but can be used with terminals not providing these voltages with the use of a polarity independent 9V plug pack. There is an orginate/answer facility, in line with Telecom's permitted use of acoustic modems. The message exchange network is faster than the conventional Telex network.

See Mr Robert Powell, Electro Medical Engineering Pty Ltd, 69 Sutherland Rd, Armadale, Vic.; Tel: (03) 509 5844.

Dick's DOS

Many of the disc operating system programs provided for use on micros are much harder to understand and use than BASIC, making effective computer use quite difficult for the novice.

Dick Smith has put MICRODOS on the market, a DOS developed with people who are used to programming with BASIC in mind for business and professional applications.

Written in machine language like other DOS programs, MICRODOS loads into memory to become a "transparent" addition to existing BASIC interpreter firmware in ROM. It adds an extra set of commands, so disc programming is done in BASIC.

It comes with a simple data file handling program, which contains an explanation of MICRODOS, and a number of other utility programs which, because they are written in BASIC, can be easily modified by the user for his/her own needs.

It's a good little package, and the best news of all is that it's cheaper than most other conventional DOS programs. $35 gets you the diskette containing MICRODOS and all the necessary documentation, at all Dick Smith stores.

Dick's dollars

Dick Smith, most famous in Australia for my Prolific Press Release Award (and also for his rather large electronic business), has hit the headlines twice recently.

The first time was for his spectacular leap, in a double-decker bus, over a whole string of motorcycles. The second was for his spectacular leap, in the director's chair, into a partnership with Woollies – striking fear into a whole string of competitors. If you can call other people in Dick's line of business, competitors.

An exchange of several million dollars for a 60% share in the business, whatever your stand on political economy and multinationals, is a very healthy move for Dick and probably we mortals.

He, and all his brilliant ideas will stay in the chairman's seat, and Woollies hard stuff will give the company freedom to develop those ideas and give Dick the freedom to entertain us with his treks and flights and jumps and such. The next merger should be with the Guiness Book of Records. Let's hear it for the little Aussie battler.

PhD in Gamesology

Speaking of little Aussie battlers, a new Australian company has been formed to import American software, has one of those dreadfully precocious programming boffins writing zappy high-speed games, such as "Super Breakout", written in machine language for the TRS-80 Level II.

Challenger PROM

Ohio Scientific have released a new PROM for their range of micros. Most of the new features are related to cursor control; destructive backspacing, non-destructive forward and backspacing, in-line editing and an instant CLEAR key.

More details and prices from System Automation and dealers.

De news from Deforest

A few new things worth looking at from Deforest Software, this month.

A Data separator will get rid of read or seek errors on the inside tracks of your disc drives for around $45. There's a CP/M operating system for both Models 1 and 2 of the TRS-80.

And the new DOS 80 has finally arrived. It's a powerful DOS with 4K variable length fields, security boot, and more.

Deforest is at 26 Station St., Nunawading, Vic.
Tel: (03) 877 6946

Discount discount

The Logic Shop in Melbourne and Sydney, is celebrating its first birthday by giving discounts on the Compucolor. As they refuse to say how much of a discount it actually is, I'm not yet sure whether congratulations are in order.

Advanced thingammy

Computerware tell us that their new XYMEC HY/Q1000 is tomorrow's printer, with virtually every advantage built in as standard. The only advantage it doesn't have is a pronounceable name.

It prints in English and five other European languages, in bold face and reverse (reverse?), has proportional spacing, and changing printwheels or typefaces takes but seconds.

Dyslexic Men of tomorrow see Computerware today, at 305 La Trobe Street, Melbourne.

$24,000 Available from ADE NorthStar

ONE $200 GOLD COIN* WILL BE GIVEN TO THE FIRST 100 CLIENTS WHO PURCHASE A NORTH STAR MICRO COMPUTER MODEL HZ-64k-2Q DURING OCTOBER 1980

NORTH STAR MICRO COMPUTER — over 15,000 operational throughout the world

This offer is not open to ADE staff, representatives or registered dealers

* Subject to availability

For Details contact your Local Dealer listed below

FEATURES
- 64 kb Memory
- 2 X Quad Density Disk Drives (720 kb)
- Z 80A Processor
- DOS Operating System
- Basic, Fortran, Micro Cobol and CP/M available.
- Motherboard contains 12 S-100 board slots.

See the NORTH STAR on Stands 38-41 at IFIPS 8th World Computer Exhibition

PERIPHERALS
- TV1 — 912B Display
- T.I. 825 Ro Printer

OPTIONAL
- ML-80 80 Column Printer
- Qume Letter Quality Printer

ADE

Anderson Digital Equipment Pty Ltd

— THE VIABLE ALTERNATIVE —

P.O. Box 322, MT WAVERLEY, VIC AUST 3149 Phone (03) 543 2077. P.O. Box 341, PENNANT HILLS, N.S.W. AUST 2120 Phone (02) 848 8533. Adelaide: 79 9211. Perth: 325 5722. Hobart: 34 4522. Brisbane: 350 2611. Darwin: 81 5760. Canberra: 58 1811. Newcastle: 69 1625. Albury/Wodonga: (060) 2671. Barnawartha 129. N.Z. Wellington: 69 3008. Auckland: 66 3833. Christchurch: 79 6210. New Guinea Lae: 42 3924.

Accredited Dealers: The Software Works 578 3545; Alfatron Pty. Ltd. 758 9551; Abacus EDP Services Pty. Ltd. 429 5587; Comp-Soft Microcomputer Services 428 5269; CPM Data Systems Pty. Ltd. 375 2144; K-Power Computer Systems 428 2334; Delta Scientific Product Distribution 366 3742; Informative Systems Pty. Ltd. 690 2284; M. J. Pratt & Ass. Pty. Ltd. 842 3666; Logic Shop Pty. Ltd. Melb. 51 1950; Computer Decisions Pty. Ltd. 267 5633; Mensa Computers Pty. Ltd. 26 5683; The Logic Shop Pty. Ltd. Syd. (02) 699 4910.

Ring of confidence

Computerland has that ring about the freshness of standards in small business systems.

Computerland is confident that their experience in the micro industry has given them knowledge of the requirements of Australian small businesses. User training is an option, and maintenance contracts are available within the Melbourne Metropolitan area.

The Archives computer has the usual 64K of RAM and 744K of disc storage upgradable to three megabytes. It's based on the standard S100 bus system, and several languages are available. Software includes the "Wordstar" word processing system, and lots of application goodies.

Further details at Computerland, 555 Collins Street, Melbourne.
Tel: (03) 62 6737.

Extricating your digits

ADE has a new Digitizer for the Apple II which is hardware and software supported. The DT-11A version of the HI PAD provides a slot interface card for the Apple, a floppy based software package, and stylus. A plastic overlay serves as a menu and allows users to generate a variety of manipulable colour graphics displays.

Functions include Draw, Line, Area, Background, Shape, Pen Colour, Separate Catalogue, Save, Load, etc. The DT-11A has slot independence, BASIC and Pascal compatability, optional cursor and assembler driver code. It requires a 48K system and the Applesoft Firmware Card. The entire package costs $995 plus tax, and is available from Anderson Digital Equipment Pty Ltd, P.O. Box 322, Mount Waverley, Vic., 3149; Tel. (03) 543 2077.

New at B.S.

The new 8000 Series Commodore CBM microcomputer and disc drive has arrived at B.S. Microcomp. It has all the features of the 3000 Series, plus an enhanced BASIC interpreter, 80 column screen and improved text storage on two single sided 5¼" discs. As well as a built-in disc operating system, the 8050 supports relative random files, automatic diskette initialisation, appending to sequential files and an improved error recovery.

Info from B.S. Microcomp, 4th floor, 561 Bourke St., Melbourne, 3000; Tel' (03) 614 1433.

Runaway PET

Hot on the company gossip trail, the latest at Hanimex is that they've lost (if that's the polite word) the Commodore distributorship. They've also lost (that word again!) Nigel Sheppard, whose loyalty lay with his PET, which he's followed to its new stable at . . . ?

Just over the horizon

Anderson Digital Electronics have recently started trading in the North Star Horizon Micro Computer. We don't hear much about the North Star, but doubtless this will change (ADE being a past PPR award holder). They've already told us that there are more than 15,000 Horizon systems in use in the world and I'm only pleased that they didn't mention that it's the biggest or best something-or-other in the Southern Hemisphere.

The North Star is a Z80 based micro with up to 64K of memory, slots for up to twelve S-100 busses, DOS and Monitor programs, and can support BASIC.

Palm arrives

GFS Electronic Imports have just been made Australian distributors for a business oriented desk top micro from Japan. It's the new PALM RL 8000, and at around the $7,000 mark is not for the hobbyist.

It has 64K of RAM, 736K dual mini floppy disc drives, a single Z80 microprocessor and can run a CP/M operating system. The VDU is detachable, green and, using a 7 x 9 dot matrix font, displays 24 lines by 80 characters.

It can handle a wide range of printers, and the CP/M allows use of COBOL–80, FORTRAN–80, Pascal and other software packages.

Apparently, GFS are also looking for interstate distributors for the PALM, so if you're interested in buying or selling it call GFS Electronic Imports, 15 McKean Rd, Mitcham, Vic., 3132.
Tel: (03) 873 3939.

Attention

I intend to set up a special section of this column for news of really urgent importance to Australians interested in personal computing. Either that, or my own readers' letters section for advice about the editor's eyesight/intelligence/humour problems.

He's just handed me a press release from the British Robot Association on their fourth annual conference on automated manufacturing. I'll just mention it in case you
(a) run a car assembly plant off your 32K Apple,
(b) get the urge to pop over to Brighton, UK, next May to have a look, or
(c) are one of those dreadful people who has to know everything that's happening everywhere.

One intriguing point, though, is that they're exhibiting bowl feeders. Have the British really beaten the energy crisis by feeding their robots hay, or am I just becoming more like the editor every day?

SORCERER SOFTWARE

SYSTEM 2 by Richard Swannell, loads into the top of available RAM and becomes an integral part of the BASIC language. All commands are single keystroke. SYSTEM 2 is written in Z80 and provides the following features:

1. **SCREEN EDITOR.** Use the editor to insert, replace, delete or rubout characters in your BASIC program. Watch the line change on the screen! Gone are the days of typing in a whole line to change one character!
2. **FUNCTION KEYS.** SYSTEM 2 allows 12 keys to be programmed to represent one or more characters or up to several lines of text each! After a key is programmed, by simply hitting key, all the text is sent to the processor just as if you typed it in on the keyboard! Function keys may be used in all modes of operation, including the editor. This feature is handy for lengthy and/or often used commands and may include multiple statements.
3. **RENUMBERING ROUTINE.** With a single keystroke your program is renumbered. Starting line number and increment may be changed.
4. **BASIC BUFFER PROTECTOR.** SYSTEM 2 sends a (CR) when the BASIC BUFFER is full. This prevents BASIC from crashing.
5. **PRINTER DRIVER.** Simply hit CTRL P to direct output to Centronics printer.
6. **RIVIVAL ROUTINE.** If NEW or CLOAD are typed, or RESET is hit by mistake, your program may be recovered. This is a safety device.

OTHER FEATURES

- RUNSTOP stops execution until any other key is hit.
- CLEAR clears screen then sends a (CR). Hit CLEAR to start on 'new page'.
- CTRL characters such as ESC, LF and CLEAR don't return ?SN ERROR.
- RUB doesn't require the SHIFT key to be depressed. This quickens editing.
- Includes a Real Time Random Number Generator.
- Returns automatically to BASIC after TAPE CRC ERROR while CLOADing.
- Suppresses premature CRLF. Normally, if RUB is used extensively while typing in a BASIC line, the cursor will drop down to the next line before reaching the end of the current line. SYSTEM 2 prevents this.
- SYSTEM 2 requires 2K of memory and is available in 8, 16, 32 & 48K versions. **$35.50**

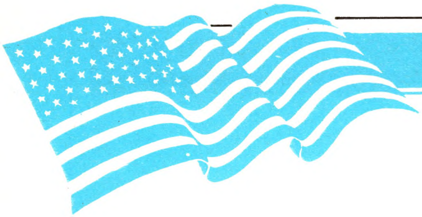
RS232 PRINTER DRIVER. Requires 250 bytes of memory and is relocatable. Suitable for MONITOR, STANDARD BASIC, WORD PROCESSOR PAC & DEVELOPMENT PAC. Stores each character in a buffer then sends the whole line at once, which solves timing problems. **$10.00**

COMBINED SYSTEM 2 & RS232 PRINTER DRIVER. SYSTEM 2 with the RS232 printer driver instead of Centronics printer driver. **$40.00**

LUNA LANDER. Written in Z80 and Basic and requiring 16K, LUNA LANDER uses graphics to the full. Land you craft on the moon in real time. But be careful to land softly, otherwise you will see your LANDER crumple before your very eyes! **$15.00**

SYSTEM SOFTWARE
1 Kent Street, Bicton, 6157 Australia

Program comes on cassette and includes full documentation. Specify size of RAM. Prices in Australian Dollars. Add $2 for overseas airmail.
SORCERER is a trade mark of **EXIDY INC.**



YANKEE DOODLES

Tom Williams, our man in Silicon Gulch, reports on the latest US micro marketing dilemmas.

Software dilemma

Here's a puzzle for all who concern themselves with the legitimate use of licensed software – and with the problems that software piracy poses for the industry. Let us suppose there is a business of some kind that has decided to install four or five desktop microcomputers around the office to do word and data processing. The installation comprises stand-alone units. each with its own CPU, RAM and at least one built in floppy disc drive. One of the tasks involved requires that each machine runs the same commercially available software package.

A problem arises when the owner of the business approaches the software vendor. Being a conscientious person, he realizes that quality software is only possible if authors have the proper financial incentive, and that outright piracy of software ultimately harms everyone involved. Besides, it's dishonest.

Now software is generally licenced for use on a single CPU and our hypothetical businessman has four CPUs, possible in the same room. There's a natural reluctance on his part to purchase four identical copies of the package when he could more easily and cheaply buy one and make copies for each of his stations. The software vendor quite understandably insists that the owner of the business is required to obtain (and pay for) four licences to use the programs.

There the two might remain, locked in eternal and unresolveable conflict until the businessman decides to follow either the dictates of conscience or the purse. Whatever the outcome, the basic question would remain unsolved. But now suppose that the business' expansion plan for the following year includes upgrading the disc storage of the desktop units with a commonly shared hard disc system. Hard disc storage can now be shared by separate CPUs using systems available from Nestar and Corvus; more such devices are under development by various other manufacturers.

When a program is written or purchased it is placed on the hard disc for use by as many of the computers as may need it at the time. We now have the rather ludicrous scenario of the conscientious businessman buying four copies of a program on floppy disc, copying one onto his hard disc for use by the attached CPUs and then carefully storing the four floppies away as backup copies. Such a scene, I submit, will never take place.

When you start using a shared disc storage system of this type, it looks to the user almost like a time shared system. Now if our businessman had purchased, say, an S100 multiuser system with four terminals, I doubt very seriously if any software vendor would have dared suggest that he pay a licence fee for each of the terminals accessing the program. The question is, for the end-user, *what is the difference?*

If there really is no difference from the point of view of the people who ultimately will decide whether or not to purchase a program as a commercial product, then some solution must be found which will render, in the eyes of the user, the relative software expense for the shared disc resource and the timeshared type system to be as equal as their functionality. You are simply not going to find that many businessmen willing to forego their own interests for the sake of conscience in the face of what appears to be a truly inequitable situation.

One possible solution is that more programs for microcomputers be licensed for use at a given 'site' or 'installation' with provision for a multiple use fee – which would be a fixed surcharge. This latter provision, though difficult to enforce, would at least have the appearance of being just. Great moral arguments could be made for paying multiple use fees in order to encourage the development of more and better software; they would no doubt fall on deaf ears – just as do today's pleas against software piracy.

Nonetheless, an intransigent attitude on the part of software vendors is not going to help anybody. The only advice I can offer at this point is that it's much easier to induce people to comply voluntarily with a situation if they feel that all are getting equal treatment. That's not to say that they will, but a sure way to make them not to is to give them a feeling of righteous indignation.

OSI's department store experience

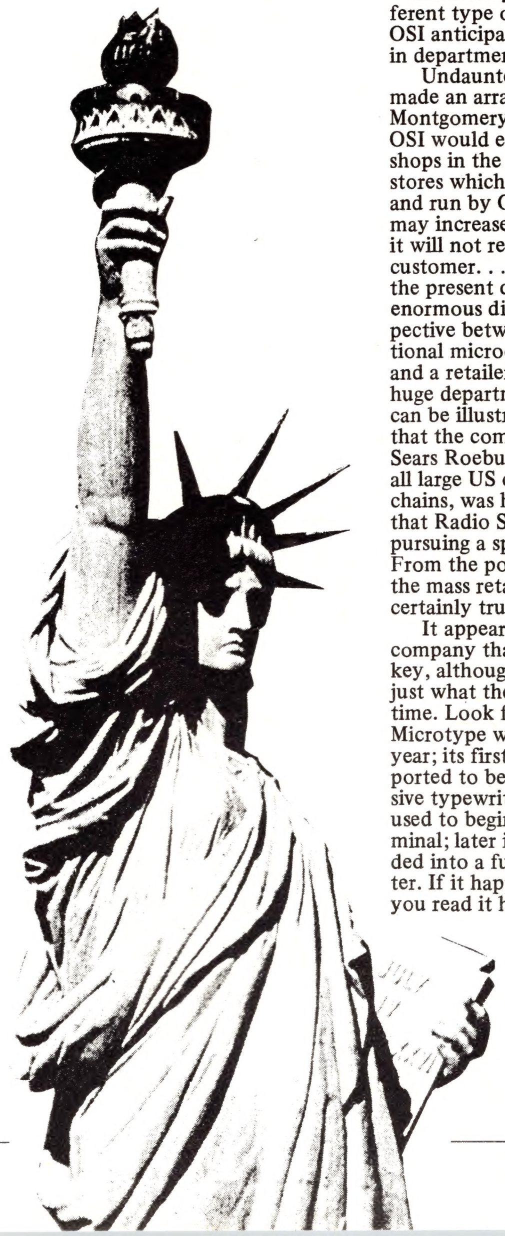
There's a vague feeling in the microcomputer industry that there lurks an as yet untapped but incredibly vast mass market awaiting the lucky company that discovers the key to placing a computer in every home. Although this particular grail has not yet been found, there are many knights-errant galumping about in search of it.

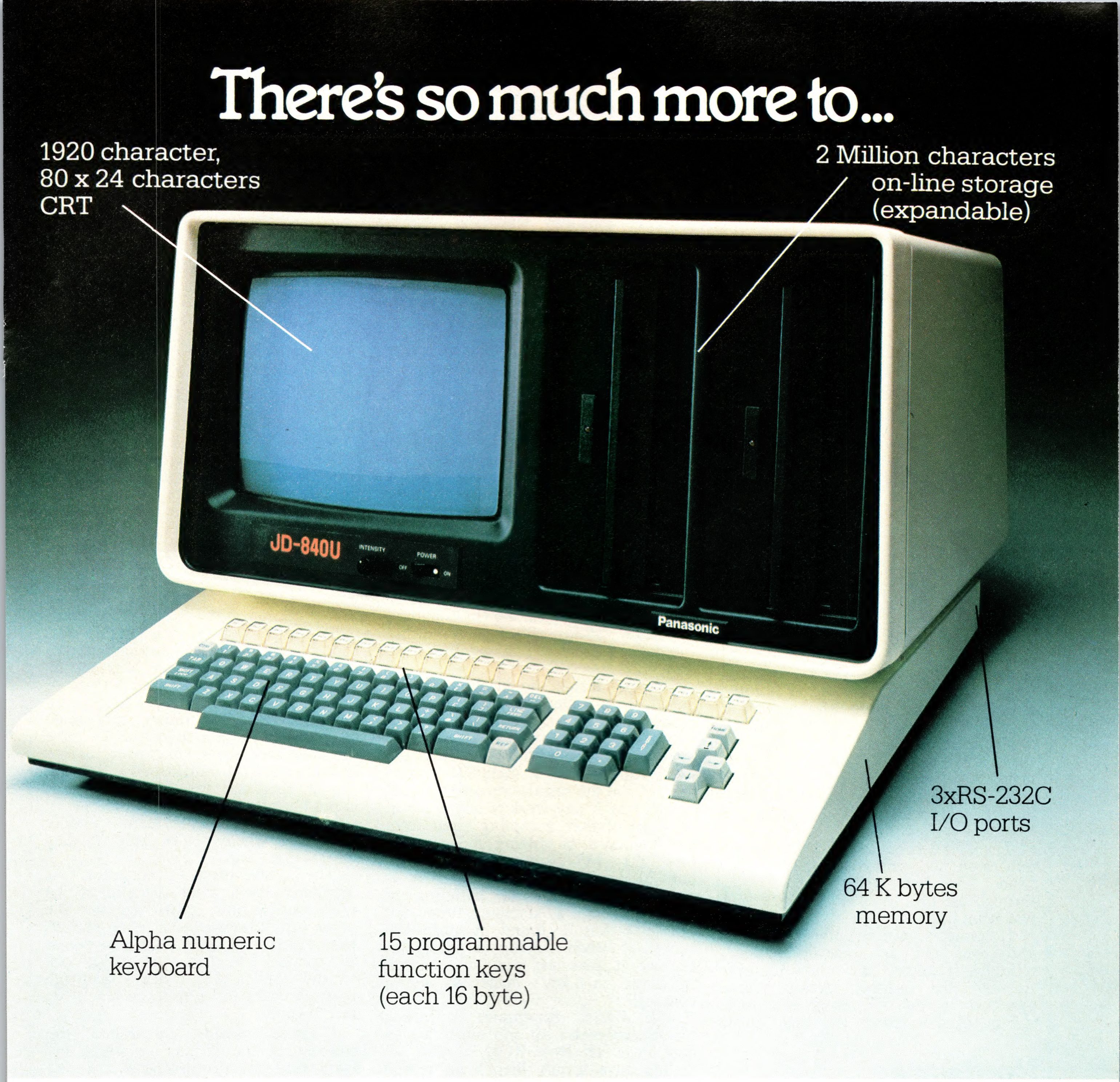
One idea has been that if micros were placed in the proper distribution channel – say a large chain of department stores – they would find their way into the home and win mass acceptance. Ohio Scientific Instruments, whose main computer line is concentrated on higher end machines for business, recently completed an experiment in marketing their low-end computers through selected Montgomery Ward stores in the US.

What OSI discovered was that the customers who were interested in microcomputers wanted to know about business applications. Unfortunately the Montgomery Ward sales clerks were not qualified to answer the type of questions these customers kept asking. Most department store personnel are only able to handle concepts at the washing machine and hair dryer level and thus a great many potential sales were lost – admittedly sales to a different type of customer than OSI anticipated it would find in department stores.

Undaunted, the company made an arrangement with Montgomery Ward whereby OSI would establish computer shops in the department stores which would be staffed and run by OSI dealers. This may increase OSI's sales, but it will not reach that magic customer. . . the object of the present quest. There's an enormous difference in perspective between the traditional microcomputer dealer and a retailer on the level of huge department stores. This can be illustrated by the fact that the computer buyer for Sears Roebuck, the largest of all large US department store chains, was heard to remark that Radio Shack was still pursuing a specialised market. From the point of view of the mass retailer that is most certainly true.

It appears there may be a company that has found a key, although it's not saying just what the secret is at this time. Look for the name Microtype within the next year; its first offering is reported to be a very inexpensive typewriter that can be used to begin with as a terminal; later it can be expanded into a full-blown computer. If it happens, remember you read it here first.




There's so much more to...
1920 character, 80 x 24 characters CRT
2 Million characters on-line storage (expandable)
JD-840U
INTENSITY
POWER
OFF
ON
Panasonic
3xRS-232C I/O ports
64 K bytes memory
Alpha numeric keyboard
15 programmable function keys (each 16 byte)

On Display Stand 167. 8th. World Computer Exhibition.

Our latest range of desk-top computers offers outstanding cost/performance and versatile data processing. They are easy to operate and can perform almost all general business functions. Including invoicing, stock recording accounting and word processing. As well as acting as on-line terminal for another computer. With a range of matrix and daisy wheel printers.

Application packages cover the varied fields of commerce, public accounting, real estate, dental practices, manufacturing and retailing.

National Panasonic
The Computer Company

4 Cliff Street, Milsons Point 2061. Phone 436 1733. Represented in Melbourne, Brisbane, Newcastle, Adelaide, Perth,
Hobart and most country areas, even Alice Springs and Kalgoorlie.

DEALER ENQUIRIES WELCOME

QMS G3128

BENCH TEST

SINCLAIR ZX80

by David Tebbutt

Clive Sinclair has surprised the world with the launch of his attractive, hand-held personal computer. Costing less than three hundred dollars, and plugging into the domestic TV and cassette recorder, some now suggest the ZX80 to represent the thin edge of a mass consumer market wedge.

Introduction

Sinclair Research set out to build a simple to use personal computer, running BASIC and selling (in Australia) for around $300. Well, they succeeded with their ZX80. Why ZX80? No reason really except that it's based on an NEC copy of the Z80 processor chip. . . and it sounds nice.

The machine is available by mail order and selected retailers as a fully assembled unit; there are no plans to sell it in kit form as is currently available in England. In addition to the ZX80 itself you'll need to buy a mains adaptor ("600 ma at 9V DC nominal unregulated") . . . if you buy Sinclair's it will cost you an extra $16.

The ZX80 is amazingly light, twelve ounces in fact, and easily held in one hand. The low weight is achieved through use of a moulded plastic casing just 1mm thick.

It connects quite happily to the television set and the cassette recorder, although it might take a few minutes to find the optimal settings. Once attached to the TV, it gives a rock steady display (more on that later).

Hardware

I have to say that I think it very pretty (our art director would probably beg to differ) – the casing even has go-faster stripes, which look suspiciously like ventilation slots in black and white photographs (coincidence, I'm sure). I would, however, have been happier with something rather more sturdy; ABS plastic might have done the trick, although perhaps at the cost of attractiveness.

The keyboard is most interesting; it's one of those waterproof, chemical proof, completely sealed units and it's stuck on to the main PCB. Made of a special tough plastic, the under-surface is printed with the key symbols so as to eliminate any rubbing off. Between this keyplate and the PCB containing the metal contact strips (about five per key) is a piece of sticky plastic containing forty holes which line up with the "keys". This material is about .006" thick and is just sufficient to keep the metal underside of the keyplate away from the contacts, except when touched of course.

Typing gives a sensation of drumming your fingers rather than of doing anything useful. This is a totally mistaken impression because it really works rather well. For those who are interested, I found that a "wiping" action was more successful than the tapping movement usually associated with typing. Typists may be pleased to hear that the keys are in standard QWERTY layout although somewhat compressed compared to, say, the office IBM.

Looking inside the machine, I find that it's controlled by an NEC 780-1 processor chip . . . a copy of the well known and very successful Z80. This CPU, running at 3.25MHz, does all the work for the ZX80, including driving the TV and the cassette recorder. You'll notice that if any work is taking place, be it calculation, accepting input from the keyboard or driving the cassette, then the TV picture disappears – only to return when the activity is complete. This can be irritating to observers (at a demonstration for example) but I found it positively beneficial when keying in programs because it gave me positive feedback whenever a key made successful contact.

The BASIC interpreter, operating system, character set and editor are all held in a 4K Byte ROM. If you are feeling adventurous there's no reason why you shouldn't pop your own ROM (TMS 2532) in its place.

Memory in the basic system comprises 1K static RAM; you can add to it via the expansion port, giving a maximum potential of 16K. The memory expands with the aid of plug in modules, each designed to carry up to 3K in 1K increments. Thus five modules would be required to give the 16K maximum. At switch-on the machine does a memory check which also tells the system how much memory is online. Should you reconfigure the memory, then the command NEW will execute the memory check cycle again.

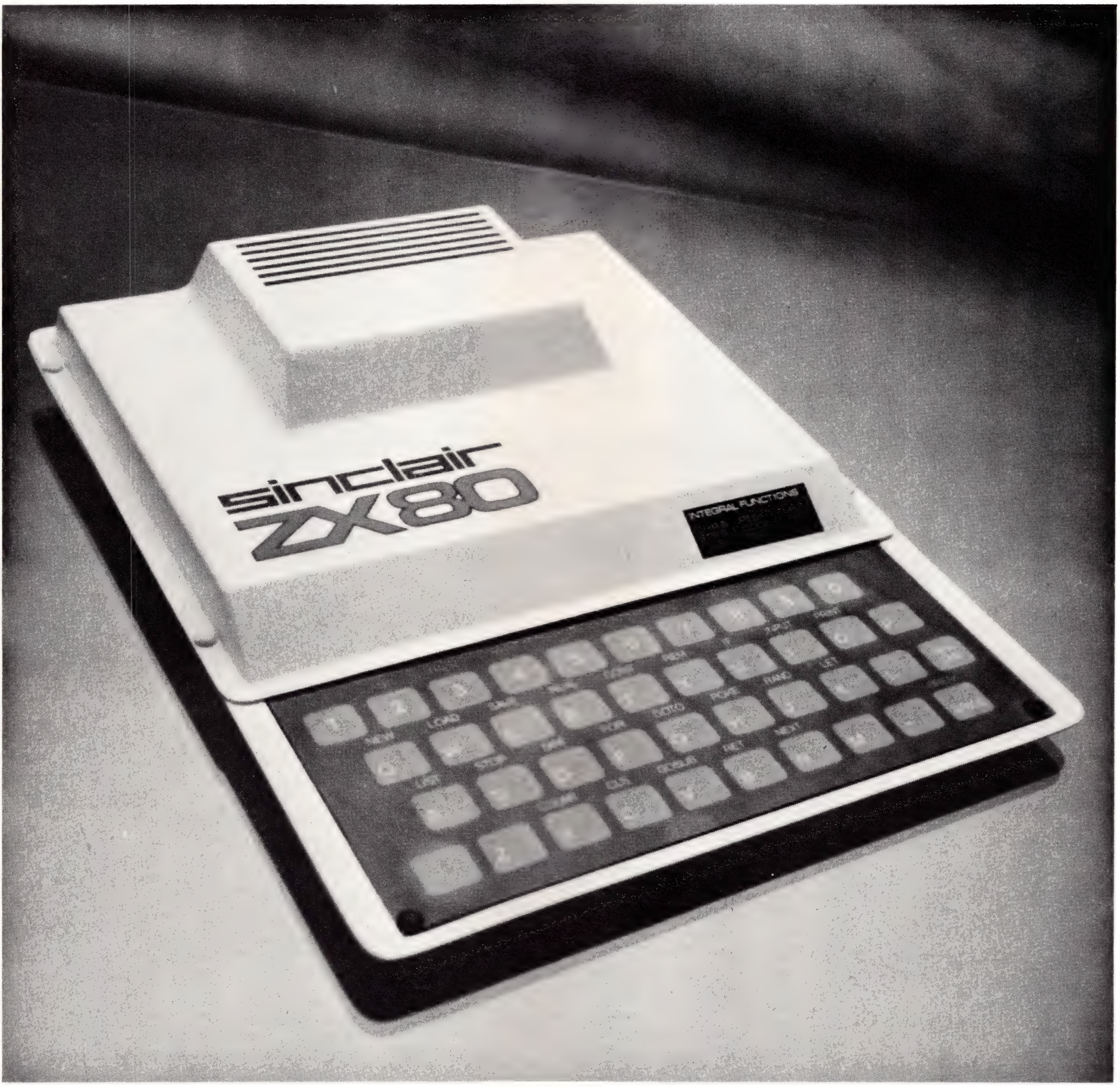
Moving on to the "outside world" connections, there's a cassette interface, TV socket and a hefty edge connector. The cassette interface comprises two 3.5mm jack plug sockets, securely mounted on the main (and only) PCB. One connects to the "ear" socket on the cassette recorder and the other to the "mic" socket. There is no facility for remote control of the cassette motor. Anyone with DIN sockets will have to buy a jack plug to DIN connector lead.

Although I encountered one or two problems at first, once working, the cassette interface proved trouble free. My particular recorder had a nasty habit of recording noises when the CPU was "sending out" silence. This caused the system to get its knickers in a twist when reading from cassette because it expected silence just before the file header record. After a couple of hours (what a confession) the culprit was found – the "ear" lead, which acts as a monitor while recording, was setting up some sort of oscillation. Answer – simple – disconnect the "ear" jack when recording. Another tip which ensures trouble free loading is to move the tape into the silent section before issuing your LOAD instruction. Rumour has it that the cassette operates at around 250 baud – I believe it, although it doesn't seem terribly important when you're only loading the 1K that I was.

The television connector is simplicity itself. Plug one end of the cable (supplied) into the ZX80 and the other into the television aerial socket, tune to channel 36 (UHF), and you're in business. The display is magic; rock steady and very clear although reversed characters (white on black) are not so good.

I have already mentioned the business of the display switching off every time the processor needs to do something else. If this drives you mad then you'll have to forfeit some of the undoubted pleasures that this machine has to offer. The screen is not memory mapped; it's treated like a serial file – like a printer in fact – which means that fast moving graphics are out of the question. No doubt some clever Dick out there will take up the challenge and fudge the system, just to prove me wrong. More about the reasons for this in the Software section, but anyone who is hooked on white characters on a black background can suitably modify the PCB, though why they should want to I'll never know. It's a matter of cutting one track and making a small bridge to another.

American television (525 line) users are catered for as well; all they need to do is solder in one diode and the system is converted from 50 to 60Hz standards. Do you take your computer camping with you? You'll be pleased to hear that it can run from a car battery provided that the lead regulates the supply. I believe you can buy a cigarette lighter plug with a



built in regulator . . . couple that with a portable TV and a battery powered cassette recorder and you'll be the envy of the campsite.

Now let's look at the hefty edge connector. This is where the memory expansion modules fit in, each one being "piggy backed" on the one previous. Thus there are always 44 contacts available for outside use. There are 37 lines drawn from the CPU plus 3 power lines (at OV, 5V and 9V); the other lines comprise two earths, a "clock" signal and an "external memory in use" indicator.

All in all, the Sinclair ZX80 is a well designed, well produced personal computer. Memory addition comes a bit expensive at $600 for the full expansion but Clive Sinclair tells me bigger RAMs are on the way – that means cheaper expansion when they appear.

I'm sorry that there are no pictures of the machine's innards. The fact of the matter is that I was given one of the development machines which had a couple of "Veroboarded" EPROMS and a selector IC floating around on the ends of some pieces of wire which in turn were soldered into the "official" ROM socket. I thought it best to spare Mr Sinclair's blushes.

Software

The software of the ZX80 comprises the BASIC interpreter, the Editor and whatever it is that does the rest of the work (Operating System seems too grand a title). Rather than looking at each separately, I shall examine them in the order they might be encountered.

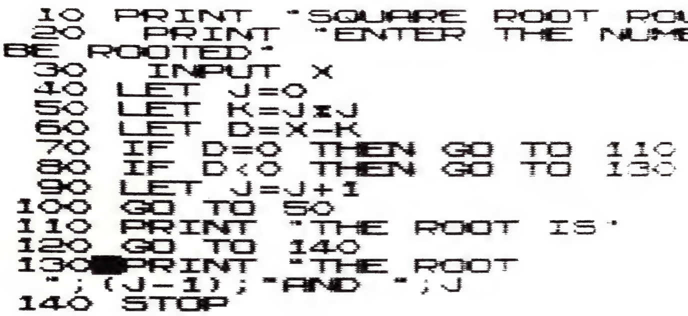
First of all the keying in of programs. For two reasons it's an absolute joy! First you don't have to type in many of the BASIC instruction codes, one key is sufficient; second you cannot enter anything that is syntactically incorrect. Some BASIC instructions have to be entered the long way (these are listed above the keyboard) but 29 of the instructions may be entered with a single keystroke, while only 8 need to be keyed in full.

As with many micros most of the instruction codes are stored in a single byte. Normal Z80 machine code can be entered using the POKE statement and executed with the USR instruction. This should keep the buffs happy after they have tired of BASIC. Syntax checking is superb – it's impossible to go wrong. Every character is checked on entry and, if the interpreter thinks that you are going to make a mistake, it signals with a reverse S (for Syntax) at the point it thinks you have gone wrong. If, later in the same line, you correct the error, then the marker disappears. What a grown up facility for such a small machine! Incidentally, the program lines are displayed very clearly with line numbers, instructions, operators and what have you being nicely spaced out.

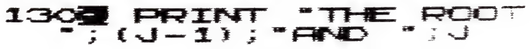
Inside the memory, however, there's a completely different story. The lines of code are held as compactly as possible with most of the commands and operators occupying one byte each. The spaces are removed and there are very few extra bytes needed – for instance the new line code is one byte,

TECHNICAL SPECIFICATION

CPU:	NEC 780C-1 (copy of Z80) 3.25 MHz
Memory:	1K static RAM, expandable to 16K
Keyboard:	Keyplate, under-surface printed
Screen:	Use own television. Pixel graphics 24 lines x 32 chars.
Cassette:	Use domestic audio cassette recorder.
Bus:	Edge connector with 44 lines — 37 from CPU, 0V, 5V, 9V, Clock, External memory indicator and two earths.
Software:	4K ROM containing BASIC, Editor and Operating System



```
 10 PRINT "SQUARE ROOT ROUTINE"
 20  PRINT "ENTER THE NUMBER TO
BE ROOTED"
 30  INPUT X
 40 LET J=0
 50 LET K=J*J
 60 LET D=X-K
 70 IF D=0 THEN GO TO 110
 80 IF D<0 THEN GO TO 130
 90 LET J=J+1
100 GO TO 50
110 PRINT "THE ROOT IS"
120 GO TO 140
130█PRINT "THE ROOT
 ";(J-1);"AND ";J
140 STOP
```



```
130█ PRINT "THE ROOT
 ";(J-1);"AND ";J
```

although I did notice that the "=" operator needed one extra for some reason. I'm sure there are others, but I'm equally sure they are very few and far between. An example of the storage requirement is as follows:

10 FOR A=16424 TO 17424	18 Bytes
20 PRINT PEEK (A);	12 Bytes
30 NEXT A	5 Bytes
40 STOP	4 Bytes

So you see, the storage for that program (displaying the 1K memory) is 39 bytes long – an average of 10 bytes per instruction. I'll leave you to work out what sort of program you can get in 1K. Perhaps I should mention that the screen buffer uses part of the 1K, as does the stack and system control area. The stack is held at the top of memory and "grows" down; I put 327 entries on it before it stopped accepting them.

The program and variables "grow" up into the screen buffer thus reducing the amount of data on display. Eventually it's possible for the program or variables to grow so large that there's nothing left on display. It was while experimenting with this interesting feature that I crashed the system. It seems the software couldn't cope with someone entering a string 868 bytes long! After about 424 bytes of input the screen removed another character every time I keyed in a new one – it was most odd to watch.

Another way of crashing the system, in fact the only other way I could find, is to hit the EDIT key while in the middle of an INPUT loop. This returns the current program line with a syntax error which is impossible to clear. For those who are feeling unhappy about all this talk of crashing systems, don't worry, it's not as bad as it sounds. In the first place you have to enter forty characters after the screen has gone blank, and in the second place you can only hit EDIT when you are also holding the SHIFT key down.

Now it may be that, having loaded your program, you wish to edit it. Well once again there is some rather excellent software to help you. The Editor enables you to move a "current line marker" up and down the program text. Wherever it is you will always be able to see the marked line and at least some of its neighbours (it's called getting it in context). Pressing the HOME key causes the marker to disappear – it has in fact gone to an imaginary position, one above the first program line. Having reached the line to be edited press the EDIT key and the line will be presented at the bottom of the screen ready for you to do your worst. From now on it is as if you are entering the line for the first time.

The benchmark timings show the ZX-80 to be very fast, even though I had to introduce some extra code to make some of the instructions work. Specifically I had to bracket expressions like LET A=(K/K)*K)+K–K. . . if I hadn't, the expression would have exceeded the ZX80's capacity. The machine can only operate on integers and these must have values from –32768 to 32767. I couldn't execute Benchmark 8 because the machine has no logarithmic or trigonometrical functions built in.

Finally, it's possible to save programs and any variables associated with them. If you want to make use of those same variables when reloading the program, use GOTO rather than RUN. Although it's possible to SAVE programs in this way, no provision has been made to save files – yet.

That's about it for the software; once again, considering the size of machine and price, I think that it's not at all bad.

BASIC

The ZX80 BASIC has been well thought-out and, while it lacks some of the elegance and sophistication of the bigger machines, it's a very usable version of the language.

The main limitations relate to file handling and mathematical functions. File handling facilities don't exist, except by SAVEing the whole of memory (which is probably not as daft as it sounds). It does mean that you can save a program with all its variables, reload it the next day, remember to kick off with a GOTO rather than RUN, and carry on from where you left off. On the small memory machine it doesn't seem that important, but on the larger memory machines it means you can hold some reasonable sized files together with your program.

The mathematical limitations are possibly more serious. The fact is the BASIC can only handle integers in the range – 32768 to 32767, no decimals, hence the programmer must write a

BASIC

String Expressions

CHR$(n)	TL$(s)	STR$(n)	

Integer Expressions

PEEK(n)	CODE(s)	RND(n)	USR(n)
ABS(n)			

Statements

NEW	LOAD	SAVE	RUN n
RUN	CONTINUE	REM	IF n THEN stmnt
INPUT dest	PRINT	LIST n	LIST
STOP	DIMα(n)	FORα=n TO n	GOTO n
POKEn,n	RANDOMISE n	RANDOMISE	CLEAR
CLS	GOSUB n	RETURN	NEXT α

Operations

n**n	— n	n*n	n/n
n+n	n — n	n = n	n > n
n<n	s = s	s > s	s < s
NOT n	n AND n	n OR n	

n = number
s = string
** = to the power of

S.I. Microcomputer Products

92 Pitt St, Sydney, Australia
Postal: G.P.O. Box 72, Sydney 2001
Telephone: (02) 231 4091 232 6804
A.H. 36 1193 Telex AA71139

Dear Reader,

We at S.I. Microcomputer Products would like to introduce you to the world of serious microcomputing with the best of the equipment to suit your needs. The days have now gone, when microcomputers were something with which you played games. They have matured into a host of very powerful tools capable of handling your needs in word processing, accounting, data base communications, simulations, quality control monitoring, and industrial control to name a few.

With an **Industrial Micro Systems** computer Word Processing package, not only do you have the features of the big dedicated Word Processors at about half their price **and** you have the additional capability of processing your financial accounts, developing software in FORTRAN, COBOL, C, PASCAL, (not to mention BASIC) for specific applications but you also still have the capability, without tossing out any part of your machine, to expand to a full 8 terminal multi-tasking, multi-user system with 96 Megabytes of on-line hard disk Storage. This letter was prepared on just such a system, without retouching. What price for a full feature disk based word processor system with Qume daisy wheel printer ? - under $8500.00 . As a good example, "On the Waterfront" is written, edited and layouts done by one of our systems which cost less than $9000.00 dollars. When you consider its data processing capabilities as well, how can you go wrong?

If you just want the word and data processing without the letter quality printing then you can save yourself almost **three thousand dollars** by using a dot matrix printer instead. Still you get a system which will expand at a later date to 96Mbyte and 8 users as your business expands.

But we do not just carry systems. We can supply home computers from **Exidy**, **North Star**, just to mention two. For those of you who already have a computer, but need some other peripherals or boards with which to expand. We have small dot matrix printers like the fabulous MPI 88T and Impact Data 801; line printers like the TI-810-RO; daisy wheel printers like the Qume Sprint 5 and NEC 5510, high speed matrix/graphic printers from **Printronix** and **Malibu**. We have video terminals from Televideo, Soroc, Visual Technology and Microterm. The boards are too numerous to mention. If we do not have it in stock in Australia, then we can have it sent direct from our warehouse in Arizona, USA. When was the last time you ordered your equipment from a local supplier who quoted immediate delivery, but four months later..... Our usual delivery time for out of stock lines is 21 days, strikes permitting. Do you need a special item which no-one has. Try calling us, our buying office in the States can probably find it for you.

Why not give us a call or drop and see us. Let us show you what we can do for you.

Sincerely Yours,

S.I. Microcomputer Products Pty. Ltd.

DESIGNED FOR THE FUTURE TODAY!

CENTURY C2000

SPECIFICATIONS

Central Processing Unit:
- Utilizing a Zilog Z80A CPU
- 2 x RS232C ports (expandable to 4 ports)
- Floppy disk controller (contros up to 8 drives)
- Centronics or Diablo Printer interface

Memory:
- Memory 128KB using bank select

Disk Storage:
- 2 x 315KB disk drives
- Optional Hard disk controller for 4 x 10M byte Hard disk

Printer:
- Choice of 80/132 column various speeds 30 CPS to 600 LPM

Display Screen & Keyboard:
- 24 x 80 chr. display with Numeric pad and Cursor Control Key.

Languages:
- OPUS (Structured BASIC)

SQ:	It's a Mutli-user and Multi-processor operating system with built-in Editor, Data Base, Report and Screen generator. A new concept in software.
TEMPOS:	The ultimate microcomputer system software package. A multi-user/Multi-tasking DOS which will handle up to 7 interrupt-driven terminals simultaneously, in a true time-sharing environment. Includes OPUS/THREE, TEXTED, ASSEMBL, and many utility programs.
S.O.S.	(Single-user Operating System) a Full-function DOS which includes OPUS/THREE, a text editor (TEXTED), an assembler (ASSEMBL), and a package of useful system utility programs.
FORTE:	An OPUS run-only system monitor, perfect for end-user installations. Runs all OPUS Language Programs.
OPUS:	Business-oriented, block-structured high-level language. Includes such capabilities as extended arithmetic precision (up to 55 digits), multi-character variable names, and easy to use string operations. Includes a built-in DOS with random access files, machine code and OPUS subroutine calls, overlays, and more disc file commands.

Power/Environment Requirements
- * 240 volts (+ or — 10%)
- * No special air condition is required.
- * Operating temperature: 50ºF to 95ºF (10ºC to 35ºC). Recommended ambient 77ºF (25ºC).
- * Humidity 20% to 80% relative non-condensing.

Physical Dimensions
- * CPU and disk drive cabinet: 21.5" wide, 26" high and 26 to 33" deep.
- * Display screen and keyboard: 22" wide, 15" high, 20" deep, with removable keyboard attached.
- * Desk: 50" wide, 26" high, 24" deep. Custom sizes and finishes available on request.

abacus

ABACUS COMPUTER STORE
512 Bridge Road, Richmond, Victoria 3121.
Phone (03) 429-5844 429-4780.

little routine for each mathematical function that requires decimals to be used. This should pose few problems for those with the larger memory machines but it will undoubtedly occupy a fair chunk of the basic 1K system.

So much for bad news; now here are some of the good features of the language.

Taking numeric functions first, the BASIC offers up to 26 single dimension numeric arrays of any length. It also allows three Boolean operations – AND, OR and NOT.

The randomising functions are worth a mention. RANDOMISE n sets a seed value while RND(n) gives a random number in the range 1 to n. PEEK and POKE are both available so it's possible to read or modify memory contents; coupled with the USR function, this means that Z80 machine code routines can be executed.

Up to 26 FOR . . . NEXT loops can be nested and the number of nestable subroutine calls seems to be dictated by the amount of memory available to the stack. On the 1K machine with a short (4 line) program, I was able to get 327 subroutine calls in before needing to RETURN.

String functions, while adequate, could definitely be improved. The absence of a DATA statement and the lack of string arrays caused particular frustration. Although there are ways around these problems, they can be time consuming and messy.

The functions which are available, and which form the building blocks of string handling subroutines, are STR$, TL$, CODE, CHR$ and INPUT. STR$(n) returns a string of 1 to 6 characters representing the signed, decimal value of n. TL$ returns a string minus its first character, while CODE returns the code for the first character in a string. CHR$(n) represents the character whose value is n and INPUT allows the operator to input numeric or alphanumeric information. A nice touch is that if the destination of input is a string variable, then the BASIC kindly provides a pair of quotes which act not only as a prompt, they also save a little bit of keying.

There is one trap here for the unwary, and I fell into it. I had this nice little loop going and after a while I got fed up with it. Could I get out of the system – could I heck! I hit everything in sight but all I managed to do was crash the system (see earlier). The trick is that if you are in an input string loop, remove the quotes and then put in an arithmetic expression which will resolve outside the range −32768 to 32767.

So, that's the BASIC – I reckon that it's pretty good under the circumstances and in some respects I prefer it to the BASICs that do all your thinking for you.

Documentation

This comprises a programming cum operating manual. It's very well presented, being written by Hugo Davenport of Cambridge Consultants, with appendices by the mystery man from Cambridge who wrote the BASIC interpreter. (A fiver to the first reader to identify this elusive gent). There are a few small mistakes in the manual – none of them terribly serious and all of them being dealt with before the next reprint. It's probably good enough to learn to program from it and my only real criticisms lie in the area of what it does (or rather, doesn't do) for the raw beginner. I lent the machine to one such person for a few hours and here is his reply regarding the documentation:

I read Chapter 2 (Getting Started) and got completely lost by the third page. One minute it's telling me how to wire everything up, the next there's something incomprehensible about storing programs on tape. I couldn't find an 'Idiot's Guide to getting started' anywhere."

Maybe the Operating Manual wasn't designed with such a person in mind – even so, novices like him must surely represent a good sized chunk of the ZX80's ownership potential.

Future plans

A new ROM is being developed which will overcome most of the shortcomings of the existing system. Being 8K instead of 4K means that file handling routines will enable us to read and write tapes – even discs! This new ROM will also include the missing trigonometrical, logarithmic and floating point arithmetic functions.

Another area of development is on the memory front. A 16K plug in dynamic RAM is a distinct possibility; this will be considerably cheaper than taking the present $600 expansion route. A printer is also likely to appear in due course.

Potential use

In its present form the ZX80 offers an ideal introduction to computing. It makes BASIC easy to learn, it's small enough for it not to be intimidating and it's cheap enough that, should you decide computing is not for you, you can give it away, sell it or whatever. Indeed it's probably cheaper to learn BASIC this way than to pay for many of the courses around.

Teachers might buy it for their students' use because at the price there is no need to go through a complicated rigmarole to get the money. The 1K version can be used for fairly simple games and activities, although it's likely you will want to expand it before very long. Later, when the file handling facilities are introduced together with floating point arithmetic, I think the machine will become really useful, though still very much at the personal level. Home accounts and engineering calculations spring to mind immediately – don't ask me why! Suddenly the machine becomes something more than a teaching machine or toy; it starts to become a real computer.

Conclusion

Having just read Science of Cambridge's claims for the machine again, I have to say I agree with most of them. The only point I would question is that it offers high resolution graphics. OK, OK, so they are playing the same game as everyone else . . . all the same I feel that it should be explained. Just lately, people have taken to calling pixel graphics, high resolution graphics. Accordingly, what used to be called high resolution graphics now has to be called ultra high resolution graphics. To put it another way, the ZX80 offers a graphics resolution of one quarter of one character, plus you must write your own software to be able to use it. The TRS-80 is in exactly the same boat, unless you want to buy a high resolution add-on at about $150.

The ZX80 appears to be a well thought out machine both in terms of hardware and software. It has an excellent editor and interpreter which between them help you avoid all sorts of nasty pitfalls. The BASIC instruction set lacks one or two fairly important facilities – namely file handling and floating point calculations. Despite this, it's still a fine machine on which to learn about computing. The new ROM expected later this year will overcome the prime limitations leaving me very little to say except that I hope Sinclair Equipment can cope with the expected flood of orders and, perhaps more importantly, the after sales service which is vital in this sort of operation.

Our thanks go to Clive Sinclair for lending us the machine, and to Jim Westwood (its designer) for patiently answering so many questions.

Prices	
Built:	$295.00
Main adaptor:	$16.00
Memory expansion board: (takes up to 3K)	$28.50
each extra 1K:	$10.00
Manual: (free with machine)	$15.00

Benchmark timings (in seconds)

BM1	1.46
BM2	4.69
BM3	9.18
BM4	8.95
BM5	12.7
BM6	25.9
BM7	39.2

BM8 not performed (see text)

AT A GLANCE

First Impressions	
Looks	*****
Setting up	***
Ease of use	****
High Level Languages	
BASIC	***
Performance	
Processor	****
Cassette	***
Expandibility	
Memory	***
Bus	**
Compatibility	
Hardware	*
Software	*
Documentation	***
Value for money	*****

*****	excellent
****	v. good
***	good
**	fair
*	poor

HY-Q 1000

The World's Most Intelligent Printer

Add super printing to your computer deal...the smart way .... for under $3000.

- Logic controlled by five microprocessors
- Non-volatile resident memory
- Automatic error correction (a single character to a complete line)
- Proportional Spacing (with 1/60 inch resolution)
- Pica size type at 10 characters per inch
- Elite size type at 12 characters per inch
- Mikron size type at 15 characters per inch
- 1, 1½, 2, 2½, 3, 3½ line spacing
- Software select:
  Normal print
  Normal print, underlined
  Bold print
  Bold print, underlined
  Reverse print (white on black)
- Automatic carriage return at end of line
- Automatic storage of often used formats (tabs, spacing etc.)
- Automatic storage of often used phrases
- Multi-lingual keyboard standard
- Receive only printer
- Automatic column layout
- Through-put printspeed of 20 CPS (Minimum)
- 13.2 inch printing line
- 17" paper width capacity
- 132 columns at 10 characters per inch
- 158 columns at 12 characters per inch
- 198 columns at 15 characters per inch
- Automatic paper feed
- Built-in anti glare shield
- Accepts carbon or fabric ribbon cartridge
- Various color ribbons available
- Automatic centering of titles
- Automatic printing of VERTICAL lines (to separate columns)
- Automatic relocation key
- All printing elements Multi-lingual
- Automatic decimal point location
- Automatic carriage positioning
- Electronic digital readout to show:
  Number of characters till end of line
  Number of lines till end of page
  An existing error condition
  Selected automatic functions
- Switch selectable strobe, busy and acknowledge polarities on centronics 779 interface
- Signal light indicates when in upper case
- Switch and software selectable upper case/lower case normal
- Signal light indicates when in auto column layout mode
- Allows carriage return without line feed
- Allows line feed without carriage return
- Electronic tab set
- Electronic tab clear
- Electronic tab key
- Function to cancel all tab margin and spacing formats
- Electronic margin set
- Electronic margin reset
- Automatic backspacing of 1/10, 1/12, 1/15 or 1/60 inch
- Switch and software selectable auto carriage return and line feed on carriage return
- Automatic recall of often used formats
- Automatic recall of often used phrases
- 100 printable characters
- Electronic keyboard
- Daisy wheel printing element
- Noise reduction kit (factory installed)

COMPLETE WORD PROCESSING SYSTEM WITH 32K CBM, TWIN MINI FLOPPIES AND XYMEC FOR AROUND $8,000.

COMPUTERWARE, 305 LA TROBE STREET, MELBOURNE 3000. **TELEPHONE: (03) 602 1006**

Marketing Strategies of Microcomputer Manufacturers

by Dr. Jon Patrick, Dept. of Data Processing, Prahran C.A.E.

The very earliest development of the microcomputer industry started with expert enthusiasts designing and building very small systems from readily available components. The electronics organizations who had the entrepreneurial foresight to see the potential of this market are now exceedingly prosperous. Indeed the names of Tandy, Apple and Commodore are probably better known by the public than the very long standing computer industry giants like Univac, Burroughs and Honeywell. How is it that these miniature companies have been able to achieve such a marketing coup?

When looking at microcomputer systems one must understand that their configurations have only developed a clear profile in the last few years. It is now evident that there are three styles of system packaging and each is designed to appeal to a different market and fall into a different price range.

The Category 1 machine consists of a processor, memory and keyboard built in one unit. A television monitor is added-on for screen display and it is possible to expand the system with add-on disc drives and other peripherals. The computer is designed to principally support BASIC and has a starting price between $700 and $1600. The best known machines in this category are the Apple, Tandy, Sorcerer, Commodore and Ohio C2 series.

The Category 2 machine is a fully integrated computer, housing in the one cover the processor, memory, disc drives and sophisticated VDU. Language facilities are usually unrestricted with an advanced operating system available and extra disc drives can be added if necessary. The basic price for this type of machine is about $4500 and best known brands are the Versatile, Sord and Superbrain.

The Category 3 microcomputer consists of a processor and memory in a special cage that has extra board slots to allow expansion of the system. Dual disc drives either 5" or 8" are separate from the cage but an interface card to operate the drives is held in the cage. A basic system will support only 1 user and cost about $4000, but the same system can be expanded up to about 7 users or more. However, a separate VDU will have to be supplied for each user. Usually it is possible to add on extra disc drives including large capacity hard disc drives. The better known brands in this category are Cromemco, Ohio, Altos and North Star.

This article will concentrate on the Category 1 computers as they are certainly the most popular machines no doubt because of their low price. The computers to be discussed are the Tandy Level II, Exidy Scorcerer, Ohio, Apple II, Commodore and Compucolor. Although the Compucolor is an integrated system it fits into the price range of the Category I machines and offers the same level of language features.

The usual evaluations of computers study a minimum configuration as provided by the Australian agent. Because of the different marketing strategies each computer has different features in this minimum configuration, thus the usual evaluations are of little use for comparative analysis between systems. Also with only limited time the reviewer can only test the computer with somewhat artificial data and programs which may be quite irrelevant to a particular user's needs. The reviewers pick out the good points that they can see in a machine's design but quite often dismiss their criticisms as a quirk of their own preference. On the other hand, the vendors' literature gives glowing reports that often disguise the information needed to establish real measures for comparative evaluations. Examples of information needed for comparative analyses that is not readily apparent in the advertising literature is that the Sorcerer and Apple computers require a separate monitor usually costing $100 to $150, whilst with the Commodore there is an extra charge of about $190 for cables when adding on a disc drive. As well, the Tandy and Sorcerer require a special expansion unit costing $400 to $500 to add on a disc drive. The Compucolor in comparison to the other competing machines is expensive for memory upgrades.

Indeed in some instances the computer has to be returned to the agent for installation of the extra components. This procedure for system expansion is a common policy used by large manufacturers who obviously don't want untrained staff fiddling with very expensive equipment. Also it gives the advantage to the vendor that the customer has a very high dependency on the vendor for a long time. One could almost see this marketing strategy as an income maintenance scheme.

To overcome these problems I have defined the components necessary to form a "Minimum Small Business System" (MINBIS). This configuration consists of a processor, 32K RAM, keyboard, monitor, one I/O interface (serial or parallel) as needed for either a terminal or printer and dual 5" disc drives with controller. A printer is not included in the system because of the great variations in the requirements of different businesses and the concomitant range of printer costs.

The price of each manufacturer's components that are necessary to make a MINBIS is presented in Table 1. The first two rows of Table 1 make up what I call the "basic configuration" as distinct from the manufacturer's minimum configuration which may have considerably fewer features and therefore lower price. This table of data gives us the first profile of the various manufacturers marketing strategies. Firstly, it can be seen that the systems that are cheap as a basic configuration are not necessarily equally cheap to expand.

Apple

Apple has opted for a basic unit which is versatile enough to take a lot of expansion having 7 built-in slots in the main case. As well the main board has space for a full 48K RAM with another 12K ROM dedicated to the BASIC. The result is a more expensive minimum configuration but a cheaper unit to expand. You would have to add about $400 to the monitor price if you wanted the system to operate with a colour display.

Compucolor

The Compucolor and Apple are highly orientated to colour displays and so they appear to be in direct competition. The Compucolor is the most expensive system in its minimum configuration, however it has already built-in the

	APPLE	COMMODORE	COMPUCOLOR	OHIO	SORCERER	TANDY
	($)	($)	($)	($)	($)	($)
CPU 32K RAM Keyboard	1729	2249	3099	1356 (24K RAM)	1524	1389
Monitor	100	built-in	built-in	150	150	built-in
I/O Interface	230	built-in	built-in	built-in	built-in	140
Expansion Interface Unit	Not Necessary	Not Necessary	Not Necessary	Not Necessary	499	479
1st Disc Drive and Controller	759	2417	built-in	988	1350	699
2nd Disc Drive	660	Including Cables	595	597	750	679
TOTAL MINBIS PRICE	**3478**	**4666**	**3694**	**3091**	**4273**	**3377**

TABLE 1 Price breakdown of the "Minimum Small Business System"

colour monitor and a single disc drive. So this equipment is directed at people who have the money to make a large initial outlay. Interestingly Compucolor is the only Category 1 computer marketed by a company that is an active OEM (retailer) of other brands of large computer equipment. All the other Category 1 computers are marketed by organizations that have their microcomputer as their main line. The high initial price of the Compucolor suggests the vendors are not chasing bulk sales and therefore the systems are most likely retailed on a higher profit margin than other computers. This is consistent with the fact that OEM agents generally work off larger margins than the microcomputer specialist retailers.

Commodore

The Commodore is more expensive than all its competitors both in its basic configuration and in the MINBIS configuration. The Commodore is designed as two units. The first is an integrated keyboard, processor and monitor and the second is a dual disc drive unit of substantial storage capacity. In my opinion, this type of packaging, the higher price tag and no attempt to cater for the diversity of interests of microcomputer enthusiasts by incorporating easy expansion facilities, suggest the Commodore has been designed specifically for the small business user. This conjecture is supported by the emphasis on the development of business software that the Commodore organization is currently pursuing. I daresay they realize that the higher price tag will be offset by good salesmanship on their part and in the businessman's mind by the good software. Also, the businessman once having decided on the system will be more tolerant of the gazumping tactic of paying extra for cables (about $190). After all, he sees the whole expenditure as tax deductible.

Ohio

Ohio make an extensive range of computers, the smallest being a single board unit, costing a few hundred dollars, up to multi-user systems with large hard-disc units. However in this article discussion is restricted to the Challenger II unit which competes with the other Category 1 computers. From Table 1 it can be seen that the Ohio is the cheapest basic system and also the cheapest MINBIS. However unlike other manufacturers Ohio don't offer individual items of add-on equipment but instead they offer up-grade kits containing a number of different components. This marketing approach does make it difficult to assess the cost of individual items for comparison with other manufacturers' prices.

Nevertheless, this factor cannot hide the fact that the Ohio equipment is extremely price competitive, yet, the Ohio has not had the sales success of other brands, appears that customers prefer to be able to have immediate plug-in add-on peripherals than have to return their systems to the supplier. The prices presented here are derived from the differences between various configurations and so they may differ slightly from prices actually quoted by Ohio dealers. As well, Ohio offer many different operating systems and charges may vary depending on the particular agent you are dealing with.

Sorcerer

The Sorcerer has taken on a design that attempts to draw in the advantages of other systems. Instead of having the computer set up with a permanent language and thereby limiting the practicability of implementing other languages it has a removable ROM PAC whereby any language one wants is just plugged-in. Unfortunately whilst the idea is good only three ROMPACs, one for BASIC, one for WORD PROCESSING and a DEVELOPMENT PAC have been available for some time. to expand the system for disc drives or other peripherals you must buy and expansion. interface unit at a cost of $499. The Sorcerer uses an extremely high capacity disc drive which gives the user a great advantage but, on paper, makes expansion of the system appear very expensive. I shall make further comment on this apparent cost later.

Tandy

The Tandy computer like the Sorcerer offers a basic system at a low cost. Indeed Tandy have taken this marketing strategy to the extreme with the Level 1 system costed at $699, although such a system is so diminutive it is of little use in any substantial application. Of course, their strategy has been extremely effective at setting up a wide customer base as once the user has a minimum system they will not be inclined to switch to more cost competitive equipment.

To expand the Tandy to a MINBIS system an expansion interface unit is needed to hold the extra memory boards, disc controller and I/O interface. The Tandy design strategy of modularizing all units has lead to the situation where each unit including the monitor, central processor unit, expansion unit and two disc drives all require their own mains power supply. If we add a printer to this list then there is a great clutter of 6 cables all vying for the wall socket. The solution to connecting all the units into the mains is relatively simple with the use of a bank of 6 sockets that has one cable to the mains outlet. However this solution does add somewhat to the clutter already on the floor. But on a more serious note I wonder whether the mains wiring in a house or office is suitably designed to safely provide the

TABLE 2

BRAND	MINBIS $	DUAL 5" DISC CAPACITY (K bytes)	DUAL 5" DISC DRIVES ($)	DCUC $/K bytes	SSP (200K)
Apple	3478	204	1419	6.96	3451
Commodore	4666	340	2417	8.06	3861
Compucolor	3694	102.4	1390	13.57	4668
Ohio	3091	140	1394	9.96	3689
Sorcerer	4273	700	2599	3.71	2416
Tandy	3377	139	1857	13.36	4192

Disc Capacity Unit Cost (DCUC) and Standized System Price (SSP)

power drawn by such a battery of devices, or even if Tandy has studied this question.

One of the aspects of Tandy's marketing that has puzzled Australian microcomputer pundits is that while their USA prices have tumbled over the last few years the Australian prices have not diminished anywhere near as much. It is conventional wisdom that American made computer equipment can be marketed in Australia for the same number of Australian dollars as the American dollar list price, or at most 15% more because of Australian sales tax. An inspection of an Amercan magazine showed a list price for the Tandy basic configuration, listed in Table 1, is $US 998 whilst the Australian price is $A 1389. The expansion interface is advertised at $US 299 whilst in Australia you would pay $A499. This differential in price is even greater when one considers that the American dollar is valued at about 85% of the Australian dollar. The same advertisement that gave the above American list prices was actually offering all Tandy equipment at a 25% discount. One can only wonder why the benefits of cheaper production costs have not been passed on to Tandy's Australian customers. Similar price differentials can be found for the Commodore Pet with an American price of $US1295 compared to the Australian price of $A2249. The respective prices for the Commodore dual floppy disc unit are $US1295 compared to $A2417, though it is unclear whether the Amercian price includes the cost of cables.

Standardized System Price

For each computer the estimated cost of dual 5" disc drives plus controller and the actual disc storage capacity available to the user is listed in Table 2. If we divide the disc drive cost by the disc capacity we arrive at an entity which I call the Disc Capacity Unit Cost, henceforth the DCUC, with units of $/K bytes. This unit is of course the cost to the user of 1000 characters of disc storage. Before we analyse this table a few special points need to be made. Firstly the prices in column 3 include the cost of two disc drives, controller and expansion interface unit if it is necessary. For the Compucolor and Ohio system an estimated cost of $200 was made for the controller. The numbers in column 3 are the disc space available to the user as presented in the manufacturers' literature.

The Sixth column of Table 2 represents a concept that I have created which is the Standardized System Price (SSP). In other words if we could configure every system in exactly the same way what would each system cost. While it is not easy to achieve identical configurations the SSP presented here should go reasonably close. The standard system has the usual processor, keyboard, 32K RAM memory, monitor, I/O interface and 200K disc capacity. The cost of the 200K disc capacity is determined simply by multiplying the DCUC (column 5 in Table 2) by 200 adding the result to the MINBIS price (column 1) and then subtracting the price of the actual dual disc drives. The resulting Standardized System Price represents a measure of the value for money in the hardware that you are buying. If the SSP is low then you are getting good value for money. The only modification made to the SSP was for the Compucolor system where $350 was subtracted from the computed SSP to reduce it to an equivalent system with a B&W instead of a colour monitor.

The SSP now forms a basis for relative assessment of the various systems. It is of no use as an absolute measure because the money quantities have little practical meaning. The SSPs show that while the Sorcerer is expensive it gives good value for money. The Apple holds its own as a middle of the competition system whereas the Ohio though the cheapest MINBIS considerably weakens as a value for money buy. The Commodore, although the most expensive MINBIS system does improve to be ranked as fourth on a value for money basis.

Conclusion

The Sorcerer and Commodore systems offer large disc capacities most necessary for business applications. The Sorcerer offers extremely good value for money according to the SSP whereas Commodore falls in the middle of the range. The Apple scores well as being the only system that is in the leading three, both for actual cost of a MINBIS and the value for money as measured by SSP. As well, it provides flexible configuration with the 7 in-board card slots and colour output.

The Ohio is the computer with the minimum outlay and minimum expansion costs however it slips a little behind on the relative value for money measure. The Tandy system is the second cheapest basic configuration but is more expensive to expand than the Ohio or Apple. It really slips behind badly to be the second last system on the value for money SSP measure. The Compucolor has the highest price in a basic configuration but if you like the design of a fully integrated colour system then it is the one for you.

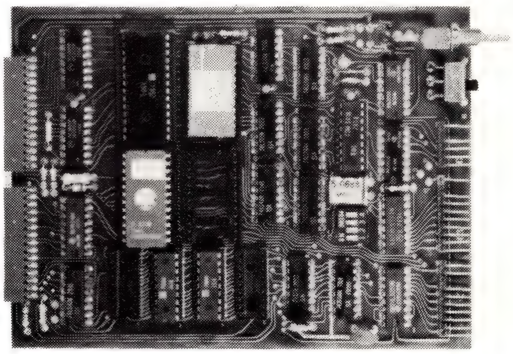
Software

This article has only looked at the hardware configurations of the 5 systems which is not the whole story when assessing computers. Benchmark tests will tell you about machine performance while a study of the BASIC will indicate the computer's language sophistication. While hardware is much easier to assess than software, it is much more independent of the user's needs. The user should think of the hardware element of a system as an engine. Engines can come as deisels or petrol or two strokes and within any of these categories a myriad of capacities, cylinder configurations and general design features are available. But it is important to buy the type of engine approximately equal to job in hand. Every engine needs wheels, gearbox, differential and appropriate body to harness the engine's power in a manner appropriate to the user's needs. It is the software that customises the power of hardware in the manner appropriate to your needs. So if you find two manufacturers' engines (hardware) equally appropriate and competitive carefully check the software so that you don't end up buying a sedan when you really need a ute.

Get Serious

Two microprocessors from MicroPro Design to provide you with a choice. The tried and proven "Front Panel Computer" or our new economical "Single Board" processor. Either way you obtain the power of the 6502 microprocessor in a form that is ready to run using the on-board digital input/output lines or any combination of the range of standard interfaces available.

MicroCon
"Front Panel Computer"
$200



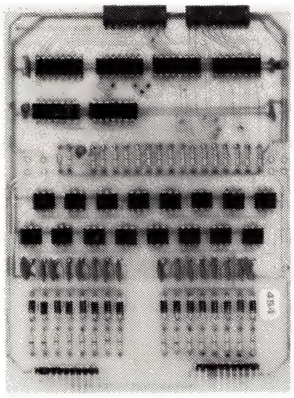
MicroCon OEM
"Single Board Computer"
$150

The MicroCon/OEM microprocessor is completely compatible with our original MicroCon. Use MicroCon as an economical development tool and when you are ready plug the programme into the OEM version to keep finished cost down.

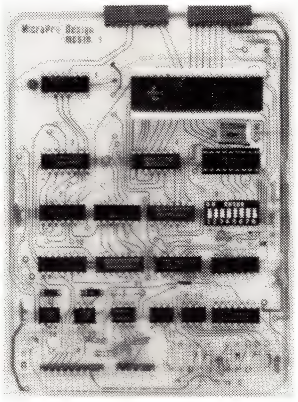
OR

With a standard RS232 terminal use the MC/OEM itself for development with our unique real-time monitor. This allows you to watch what is happening in your working programme.

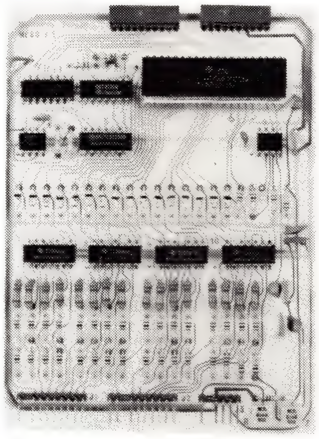
A few of the interfaces which are available to plug directly into the MicroCon system. Most cost around $100. You can even construct your own on the prototyping board which costs just $17.



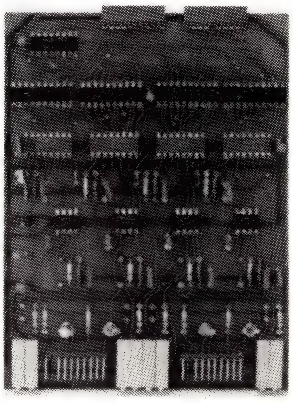
MCDI 1
Digital Input



MCSIO
Serial I/O



MCAD1
Analogue Input



MCDA2
Analogue Output

So when you are ready to get serious . . . so are we. Delivery is usually Ex-stock to four weeks. Contact us for a copy of our brochure and information about specific applications.

MicroPro Design Pty. Ltd.

P.O. Box 153, North Sydney, N.S.W. 2060 PH: 02-4381220

DIALOGUE STRUCTURE AND DESIGN METHODOLOGY

David Hebditch looks towards dialogues in this, his second visit to the man/machine interface

Before considering methodologies in detail, it's perhaps appropriate to examine the *structure* of dialogues in typical commercial microcomputer systems.

The generic use of the term 'dialogue' may be applied to a group of related and structurally or syntactically similar exchanges with the system. The grouping might be related to terminal types or application areas. For example, a 'forms mode dialogue' can take place on a display and a conversational dialogue on a serial printer. Clearly, order entry is likely to be different in style from interactive program development.

Within each 'dialogue' there may be a number of 'transactions' (see Figure 1), each being a self-contained exchange with the computer and comprising one or more input and one or more output messages. A Sales Accounting Dialogue might include an Order-Input Transaction, a Credit Note Transaction, a Customer File Update Transaction and so on.

In turn, each message will consist of a number of data items plus various formatting and control characters.

Figure 2 illustrates how a user might have access to a *transaction handler* which will enable him to select the transaction-processing routine he wishes to talk to. Once in the transaction he can get to another by returning to the handler or, in some cases, by going directly via a 'next transaction' field in the input format. This is shown in more detail in Figure 3. The transaction selection may be performed by selecting from a menu list or by entering a transaction code.

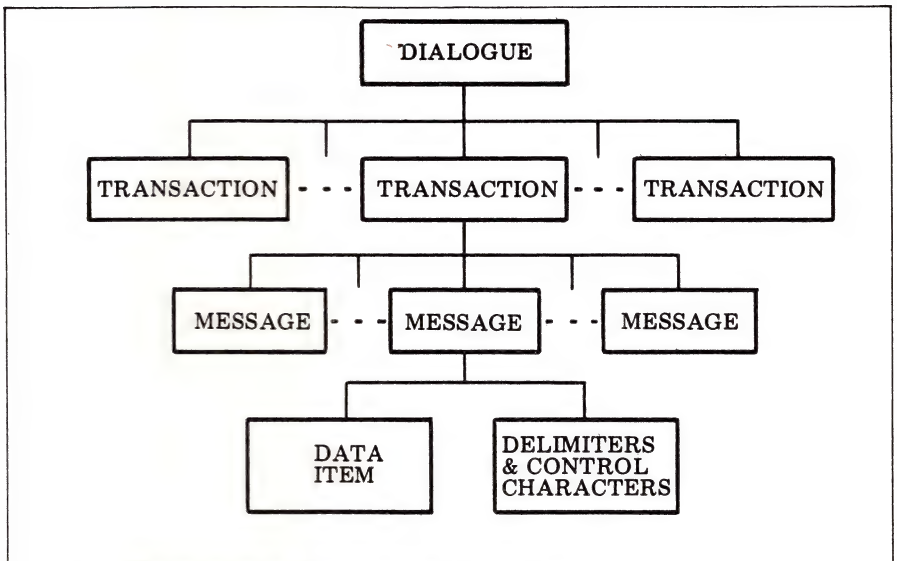


Fig. 1 The structure of user/terminal dialogues

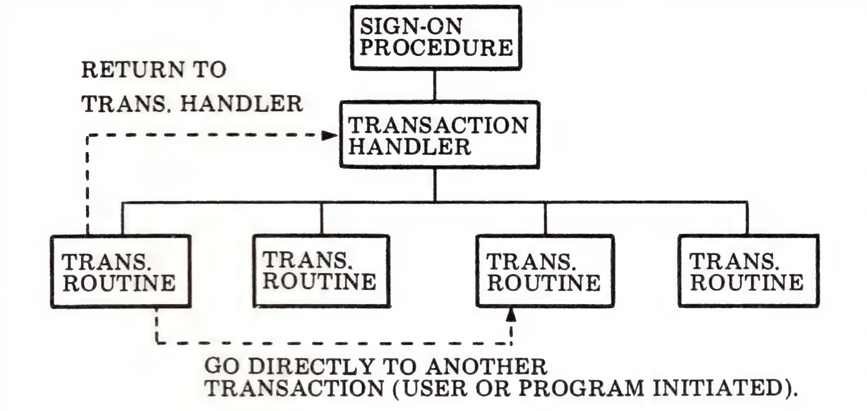


Fig. 2 Transaction handling

There are strong arguments for dialogue design to be one of the first activities in the design of the overall system. Computer usage is likely to be well integrated with the jobs of the user staff. So, from that point of view, the collection of dialogues can act as a definition of total system functionality.

The system designer's involvement with a dialogue may be relatively short-lived. On the other hand, many users may have to live with it for a number of years. Also, the designer's perception of 'ease-of-use' and 'ease-of-learning' is likely to be quite different from that of the ultimate user. The message here is that the user *must* be involved in the development of the dialogue; experience shows that this approach always pays dividends. When the system is being developed for no particular user or group of users (e.g. a package) it's important for the designer to carefully monitor the initial installations.

Figure 4 illustrates the recommended sequence in the design of dialogues. The approach is essentially 'top down' (what else!) and corresponds to the general structure of dialogues illustrated in Figure 1 above. Subsequent articles in this series will discuss each of the design stages in more detail.

Note that *error-handling* is difficult to isolate to one step in the process. In practice, the error-handling mechanisms of a dialogue can cause more design and development problems than any other aspect. One of the major benefits of a system where the user interacts directly with the computer is the resultant improvement in data quality. It is urged, therefore, that this consideration be kept in mind during *each* stage of the design process.

Choosing the most appropriate *style* of dialogue is probably the most crucial stage of the design process. The implications of getting it wrong can be fearful. In three case histories I know quite well (two in the private sector and one in the public sector) major mainframe computer projects had to be scrapped (at losses ranging from $90,000 to $300,000). In each instance the dialogue style selected was quite inappropriate to the user environment; one too complicated, one too long-winded and other too inefficient. Program structures tend to correspond very closely with dialogue structures and revising the latter is often just not feasible.

Figure 5 attempts to illustrate the complexity of relationships between the various dialogue styles and their influencing factors. In fact, the number of combinations is unmanageably large. A process of reduction, therefore, needs to be applied to the various influences. The designer needs to work through the areas shown, specifying all the influencing factors. Each of the styles described in next month's article will produce varying degrees of 'fit' with the chosen influences.

Experience with this technique has shown that it's best to view the process as one which *deselects* inappropriate styles rather than the other way around. Only careful thought and discussions

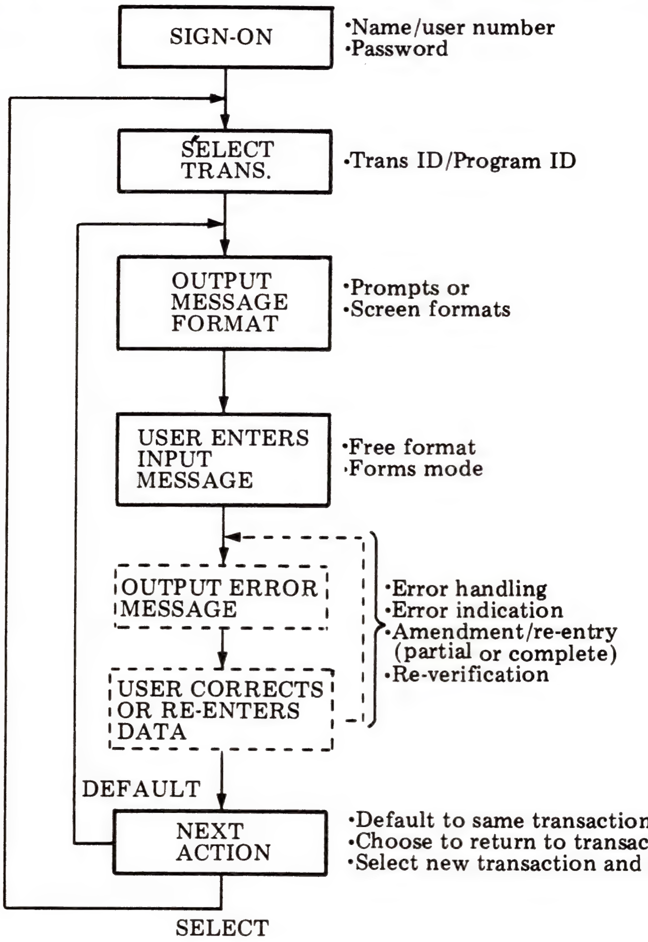
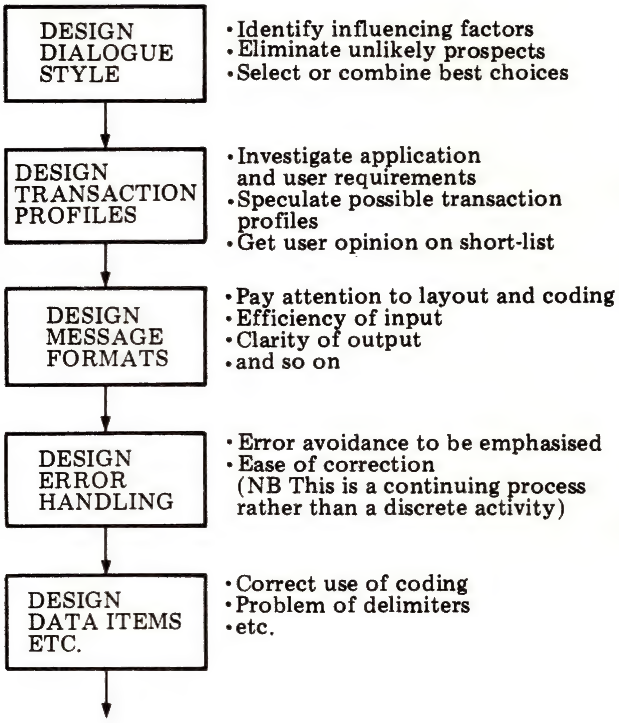


Fig. 3 Profile of a typical dialogue

Fig. 4 a structured approach to dialogue design


DESIGN DIALOGUE STYLE
•Identify influencing factors
•Eliminate unlikely prospects
•Select or combine best choices
DESIGN TRANSACTION PROFILES
•Investigate application and user requirements
•Speculate possible transaction profiles
•Get user opinion on short-list
DESIGN MESSAGE FORMATS
•Pay attention to layout and coding
•Efficiency of input
•Clarity of output
•and so on
DESIGN ERROR HANDLING
•Error avoidance to be emphasised
•Ease of correction
(NB This is a continuing process rather than a discrete activity)
DESIGN DATA ITEMS ETC.
•Correct use of coding
•Problem of delimiters
•etc.

with users can get the best combination of styles.

Next month I will begin a review of the main styles of dialogue available to the designer of microcomputer based systems.

1 Purpose	Enquiry/Data Input/Database Admin.
2 Operator Type	Specialist/ Regular/Casual
3 Operator Roll	Active/Passive
4 Operator Intelligence	High/Average
5 Operator Tolerance	High/Low
6 Level of Training	Less than 5 mins/Less than 1 day/More than 1 day
7 Response Time	Less than 1 sec/1-4 secs/ Over 4 secs/ Over 15 secs
8 Volume of Data	High/Low/ Input/Output
9 Terminal Type	Slow Keyboard-Printer/Fast Keyboard-Printer/TTY-Compatible VDU/ Commercial VDU
10 Local Processing	Intelligent Terminal
11 Complexity of Data	High/Low/ Input/Output
12 Multiple Applications	Multiple Applications per terminal

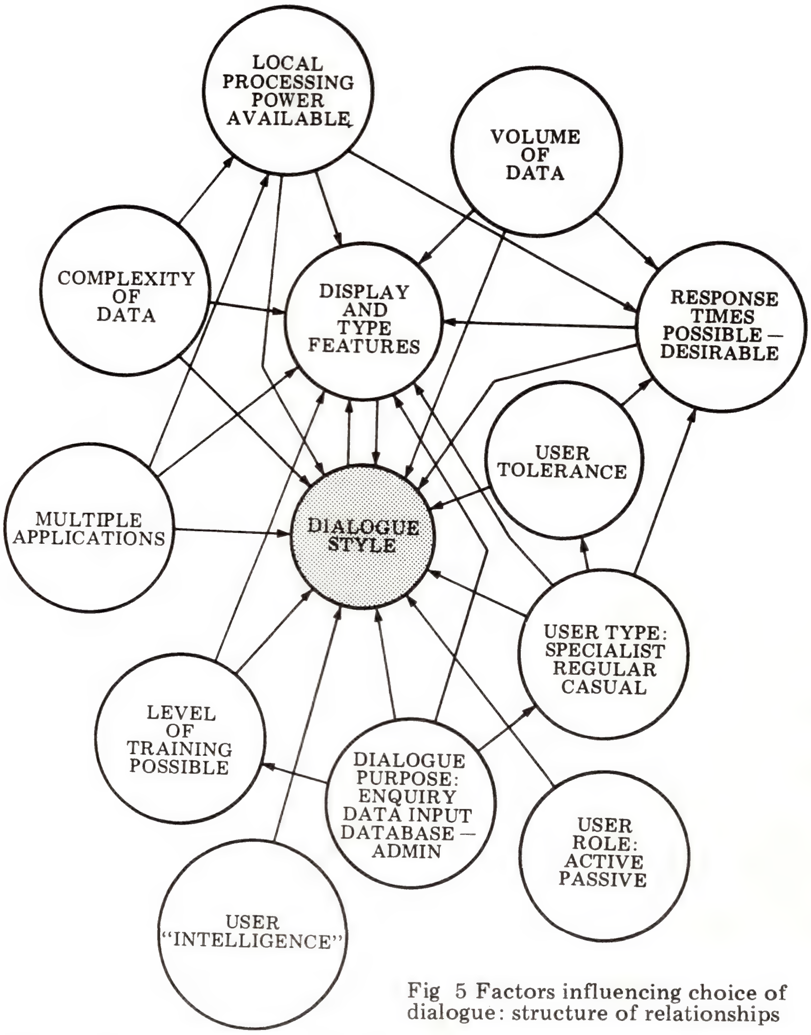

LOCAL PROCESSING POWER AVAILABLE
VOLUME OF DATA
COMPLEXITY OF DATA
DISPLAY AND TYPE FEATURES
RESPONSE TIMES POSSIBLE — DESIRABLE
USER TOLERANCE
MULTIPLE APPLICATIONS
DIALOGUE STYLE
USER TYPE: SPECIALIST REGULAR CASUAL
LEVEL OF TRAINING POSSIBLE
DIALOGUE PURPOSE: ENQUIRY DATA INPUT DATABASE — ADMIN
USER ROLE: ACTIVE PASSIVE
USER "INTELLIGENCE"

Fig 5 Factors influencing choice of dialogue: structure of relationships

NOT DESIGNED FOR MUSIC

THE TROUBLE WITH TRS-80's

We like Tandy's home computer. At 16K Level II stage it is a reliable and reasonably priced entry to the magic of computers. But that cassette!

Tandy's optional "glitch kit" makes it fairly dependable, but it's still slow, requires knob twiddling for volume level and button pushing for operation.

Enough to put you off computers!

TANDY's ANSWER

Of course Tandy has an answer, add an expansion interface and a small disk drive.

Ask the price!

ASP's ANSWER

Now we have an alternative, and its not just a matter of offering a non-standard small disk drive a little cheaper than Tandy with the attendant risk if it doesn't work.

STRINGY FLOPPY

The solution is a compact high-speed tape transport system entirely under the control of the computer - designed for data - not music. Its called STRINGY FLOPPY

There are no controls to fiddle with, just one light indicating the drive is in operation and another indicating that data is being written onto wafer. It simply plugs into the back of the Tandy keyboard unit. Or with an optional adaptor into the System 80 Computer sold by Dick Smith.

WAFERS - NOT CASSETTES

Unlike the cassette recorder that comes with the Tandy, STRINGY FLOPPY uses specially designed "wafers" about the size of a credit card and 5 mm. thick. These contain an endless loop of special chromium dioxide tape ranging in length from 1.6 to 23 metres. Their low mass means they operate reliably at high speed.

Removal of a reflective label protects them against accidental overwriting of data.

Their special tape and the digital recording method used means you don't lose data.

RELIABLE RECORDING

STRINGY FLOPPY uses a true digital recording technique like floppy disks, not fluctuating audio tone. The result - RELIABILITY.

The system was designed for computers - not designed for music.

NO MAINTENANCE DRIVE UNIT

The STRINGY FLOPPY wafer has the pressure roller for the capstan built in. So the capstan and the record head can be fixed in the die-cast aluminium drive. No adjustments required. The wafer just slides into the drive and "clicks" home. No other mechanical motion is required. And because wafers contain endless loops, the tape always travels in the same direction.

There is no need for a rewind capability.

Simplicity means reliability.

INTEGRATION TO THE TANDY

All this would be useless if STRINGY FLOPPY wasn't easy to use. So its operating system is in a permanent memory chip (ROM) in the drive unit. Using the SYSTEM command it becomes part of the Tandy. 14K of ROM instead of just 12K. Commands allow you to initialize wafers (prove their integrity), load or save up to 99 files on a wafer on up to 8 STRINGY FLOPPY drives connected to the Tandy.

Programs can be in BASIC or machine language. Loading the 1K DATA I/O program from wafer adds additional commands to store and retrieve data rather than programs.

SPECIAL BONUS

Those who know their Tandy's well will know all about the dreaded keybounce! Well, STRINGY FLOPPY's ROM contains a keybounce fix routine.

Nice?

RECORDING SPEED DENSITY

STRINGY FLOPPY records at 7200 baud (700 characters per second), 14 times faster than Tandy's cassette on a Level II machine. Tape speed is 25 cms. per second, so you can calculate access and loading times. If you "hot-up" your Tandy by increasing the clock speed you will get a proportionate increase in data density and therefore wafer capacity.

Even on a standard Tandy you can fit up to 64K on a 23 metre wafer.

PROGRAMMING

With STRINGY FLOPPY you can create programs which chain under the control of your computer. The pressure on memory diminishes. ASP has programs such as its word processor and a data base manager which can demonstrate the possibilities for clever creative programming.

THE CATCH

OK, the bottom line. STRINGY FLOPPY complete with operating system, plug pack power supply, DATA I/O program is $350.00 including Sales Tax. Add $5.00 for freight within Australia.

And we'll include a box of 10 mixed length wafers (normally $35.00) and a 2 for 1 bus extender (normally $20.00) in the price.

And a six month limited warranty.

And a year's subscription to our STRINGY FLOPPY Newsletter.

AND if you're not satisfied with STRINGY FLOPPY, return it within two weeks for a courteous refund (this applies only to non-Bankcard purchases).

So maybe there wasn't a catch.

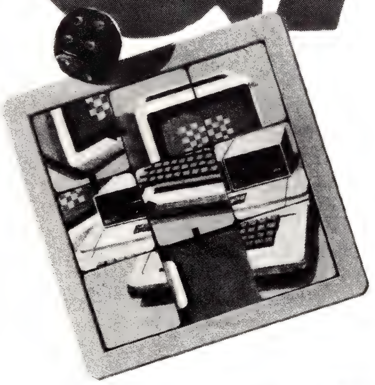
BANKCARD orders must quote full Bankcard number, Expiry Date and be signed.

Versions for other computers are available.

ASP
MICROCOMPUTERS

797 DANDENONG ROAD,
EAST MALVERN 3145.
VICTORIA AUSTRALIA.
Telephone: 211 8855 211 8344

COMPUTER GAMES



MORE COMPLEX EVALUATION FUNCTIONS

Those readers who have followed the previous articles should now have a good understanding of the principles of tree searching. The concept of the evaluation function has already been introduced (sometimes called the scoring function), but up to now only simple functions have been considered. In this article David Levy will look at those for more complex games and the reader will also be shown how to devise his own. David considers, too, some simple methods of learning, and illustrates a method that allows the program to improve its own evaluation function.

How good is good?

Show a chess master a position from a game of chess and he will most likely make some comment about which side has the advantage. He might say: "White is slightly better," or "Black has a clear advantage", or "White is winning". Press him further and he will tell you why it is that White is slightly better: perhaps the reason will be simple, such as White has an extra knight . . . or maybe it will be more subtle, such as Black having the inferior pawn structure (or, even more specifically, a pair of "doubled pawns").

In the language of chess players all of the master's comments will mean something. But when we write a chess program we have to put some numerical value on advantages such as an extra knight or a superior pawn structure, and the accuracy with which we can do this is one of the principal factors in determining the strength of our program. The result of our efforts to quantify various forms of advantage is a device called an evaluation function, and for all interesting games the evaluation function is part of the key to successful programming.

In an earlier article I suggested a simple evaluation function for noughts and crosses, the justification for which lies in the fact that only rows, columns or diagonals with moves by one player only (and not his opponent) are of any real interest. Once a row has one move by each player, that row is of no further use to either of them. I did not get this evaluation function from a World Champion noughts and crosses player, I made it up by taking a brief look at the underlying structure of the game. Alas, chess, checkers, backgammon, etc., etc., are all far too complex for such a simple approach to be possible. We must therefore rely, for our evaluation function, on the advice of experts, either spoken or in books.

There are three stages in building a useful evaluation function for a complex game, and I shall illustrate these stages by using chess as my example.

Identifying the important features

In order to be able to tell a good position from a bad one, it is first necessary to know what features to look for. If you know nothing about chess, and you and I both look at the same position, I will be able to make a fairly accurate assessment of which side has the advantage and by how much, simply because I know what to look for. You will be looking at the same thing but will not understand what you see. But suppose I were to tell you that the most important thing in chess is material — how many pieces each player has on the board, and that the player with the most pieces usually wins. Then you can count the pieces, and if White has 16 pieces but Black has only 8 you will hazard a guess that White is doing quite well, and in general you will be correct. I could further advise you that the pieces have different values: that a queen is worth 9 pawns, a rook 5, a bishop or knight 3, and that the king was beyond normal values. Then you could look at a position and fairly easily tell which side, if any, was ahead on material. You may know nothing else about chess but at least you can make a meaningful, first order estimate of which side is ahead and by how much.

If it were possible for a chess program to search a tree 200-ply deep, an evaluation function with material as its only feature would almost certainly be sufficient to enable the program to play better than Bobby Fischer. But such is the nature of the game that a 20-ply search is not yet realistic, let alone 200-ply, so our evaluation function must have more features.

In order to discover which features of the game are important, you may do one or both of two things. You may read some books on the subject, in the search for general advice (heuristics), and you may ask someone who is expert in the game. In answer to your question "What else is important in chess, apart from material?", you may well receive the reply "Control of the central squares". On investigating further you discover that pieces in the centre can move to, or attack, more squares than pieces on an edge or in a corner. And pieces that attack central squares may eventually be able to move to a central square, so attacking central squares is a useful thing to do.

3, the program would not be sufficiently careful about its own pieces, and that as WMa was increased to 5 or 6 the program's performance would also improve. The task becomes more difficult and more time consuming when using a multi-feature function. I would recommend building up your function slowly, starting with two features and getting their weightings adjusted satisfactorily, then adding a third feature and adjusting its weighting while keeping the other two constant, then add your fourth feature, and then add new ones in descending order of importance. As you add each new feature you should carry out some experiments, if you have sufficient memory, by playing the new version of the program against the previous one. You may discover that the addition of a particular feature, while giving a more accurate position assessment, results in such an increase in computation that the program can search only a much smaller tree and the end result is weaker play.

Making your program learn

You will have gathered from the previous paragraph that it is often a very time consuming and difficult matter to reach an optimal set of weightings for your evaluation function. One way to help overcome this is to make the program learn from its experience and improve its own evaluation function!

A simple example is the case of our two featured chess function:

WMa x Ma + Mo

We could modify our program so that it was able to play against itself, using two different values of WMa in each of the two "versions" of the program. If we start out in total ignorance, we could make WMa=1 in version 1, and WMa=100 in version 2. We then set the program to play a large number of games against itself, in half of which version 1 would be White and in the other half it would be Black. At the end of the series we would discover that version 1 had lost almost all, if not all, of the games. (I have already explained that one pawn is worth much more than one move.) We then set WMa to be 2 in version 1 (or we could reduce WMa in version 2) and keep the other value constant. After another series of games we would find that version 1 still lost very heavily, but possibly not quite so heavily as in the first series. If WMa was kept at 100 in version 2, we would discover that as the value of WMa reached 3 in version 1, version 1 would start to win a few games; when it reached 4 or 5 its results would improve considerably, and by the time WMa was 6 it would possibly be outscoring the version with WMa=100, because although material is more important than mobility there are situations in which the sacrifice of a pawn or two can advantageously increase a player's mobility, and WMa=100 will never recognise those situations.

This process of adjusting the weighting in accordance with the program's results can, of course, be fully automated, so you could switch on at night, go to sleep for a week, and when you woke up your program would be playing like a Grandmaster. But with more than two features in the evaluation function this type of learning process can be difficult to operate — the self-learning reaches a local peak in the n-dimensional surface representing the various possible weightings and their results (n is the number of features), and it becomes difficult to climb out of the local peak in the search for a global peak. A method of overcoming this problem was discovered by Arthur Samuel, author of a famous draughts (checkers) program, but more about that in a moment. First I would like to describe a simple method of learning called "Boxes", which can be applied to equally simple games with surprisingly effective results.

Boxes

Boxes is a method of decision taking that allows for a certain amount of program learning. A task (such as making the best move in a game) is split up into a number of sub-tasks (such as making a move in a particular game position) and a box is assigned to each sub-task. Inside the box is the information that is used by the program to guide its decision, and this information can be updated in the light of the program's experience.

Boxes was originally tested on the game of noughts and crosses. Donald Michie has calculated that there are 288 essentially different positions with which the player moving first may at some time be confronted. To each of these 288 positions is assigned one box (matchboxes were used) and inside each box there are a number of beads. The beads each have a number on them, the numbers indicating vacant elements in the noughts and crosses array (i.e. places in which the box "program" can make its next move). If one box corresponds to a situation in which elements 1, 2 and 3 are vacant, then that box will start out life with an equal number of "1 beads", "2 beads" and "3 beads".

When this box is opened (i.e. when the "program" has to make a move from the configuration corresponding to that box), a bead is drawn out at random, and the move is made according to the number on that bead. The bead is then replaced but the "program" makes a note of the fact that this box was used, and that the bead chosen was (say) numbered 2. When the game is over, the boxes which were opened during the game are referred to again. If the "program" won the game, then each box used during the game has one bead added to it, the number on the new bead corresponding to the move made from that box. If the game was a draw the contents of the box remain unchanged, but if the game was lost then one bead is removed from each box in order to reduce the probability that the same move will be played again should that situation ever arise in a future game.

The interested reader is referred to the paper (1968) by Michie and Chambers, which is mentioned in the bibliography. The authors describe how the boxes method, with some modification, learned so well that it could win at noughts and crosses between 75% and 87% of the time when it had played a series of 1,000 games against a program which played first in every game and always moved at random. Of course methods such as this are far too simple to be able to cope with games of the complexity of chess or bridge, but it is interesting to see how effective a learning mechanism it can be in a simple environment.

Samuel's draughts program

Probably the most famous game playing program up to the late 1960s was the draughts (checkers) program written by Arthur Samuel of IBM. I shall be discussing Samuel's work in some detail in a future article so here I shall restrict myself to a description of two methods of learning which the program employed.

The simpler of the two methods is called rote learning. Each time the program conducts a tree search from a position (the root of the tree), it provides an evaluation of this position based on the results of the look-ahead search. This evaluation is therefore more accurate than the evaluation which would be achieved by applying the evaluation function directly to the root position. Thus the evaluation of the root position is stored, together with the position itself, and when the program next encounters the same position, but as a terminal node, instead of applying the evaluation function to the terminal node it looks up the stored evaluation. The process is relatively fast, since the positions can be hash coded and stored in such a way as to make retrieval easy; it results in more accurate play because the evaluation taken from the store is more reliable than a superficial evaluation. The obvious disadvantage of this method, from the micro-user's point of view, is the large memory required to make effective use of the rote learning process. (By the time that the program reached the peak of its playing ability, quite a high proportion of all reasonable draughts positions were in its store, and the program played at or near championship level).

A more generalised approach to learning was Samuel's method for the self-modification of the weightings in the evaluation function. Samuel used the argument that if an evaluation function was ideal, the score obtained by applying the function directly to a position would be the same as the score obtained as a result of a look-ahead search *from* that position. The fact that the two scores are often different was employed in the following way.

Let us assume that our evaluation function has three features, A, B and C, and that the features are weighted with WA, WB, and WC respectively, so that the whole function is expressed as:

(A x WA)+(B x WB)+(C x WC)=score

where A, B and C are the quantities present of each feature. We shall denote the backed-up score for a root position by S_b, and the score which was backed-up to that same position during the previous tree search (two ply ago) as S_p. Note that if the tree search is normally n-ply, the score S_b will be the result of an n-ply search, whereas the score S_p, although arrived at during an n-ply search, is only the result of a search to depth n-2. S_b is therefore a

Attention computer users

Introducing the new 700 series Acoustic Modems

Electro Medical Engineering Pty Ltd proudly announce the release of their exciting new 700 Series of acoustic couplers. These low cost couplers are modular in design, simple to operate and offer unsurpassed performance even when both ends of the connection are acoustically coupled.

700 Series Originate Answer Acoustic Coupler

Operates at up to 300BPS Full or Half Duplex
Powered from the terminal or from a 9V plug pack
Suits all computers or terminals with RS232 compatability
Available with switch selectable answer/originate facility
1200BPS Half Duplex models also available
Communicate with others to exchange messages, programs etc.
Set up your own data base service.

The 700 Series can be ordered with an originate/answer facility that has been designed to surpass the requirements of telephone authorities around the world. Don't send overseas for acoustic couplers. They won't give reliable performance and you'll be disappointed. Sendata acoustic couplers will outperform all others and they are available here in Australia.

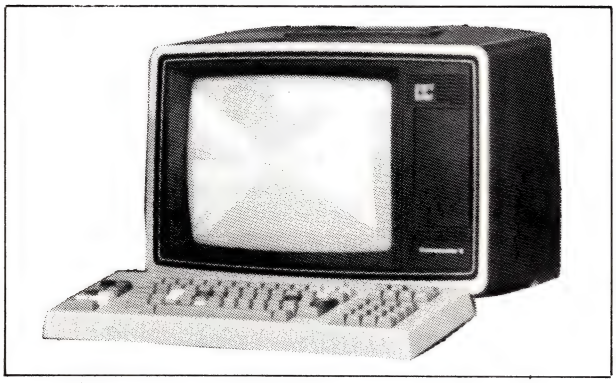
Electromeds eight years experience in the design and manufacture of acoustic couplers ensures premium performance.

For further information contact your local representative:-
VIC. A.D.E. (03) 543 2077. The Logic Shop (03) 51 1950 **NSW.** A.D.E. (02) 848 8533. The Logic Shop (02) 699 4910
QLD. A.D.E. (07) 350 2611. Management Technology (002) 34 4522 **ACT.** A.D.E. (060) 58 1811. Applied Data Control (08) 79 9211
WA W.J. Moncrieff (09) 325 5722.

ELECTRO-MED **ELECTRO-MEDICAL ENGINEERING P/L**
69 SUTHERLAND ROAD, ARMADALE, VICTORIA, 3143. AUSTRALIA. TELEPHONE: (03) 509 5844. TELEX: AA36384

COMPUCOLOR II

MICRO COMPUTER

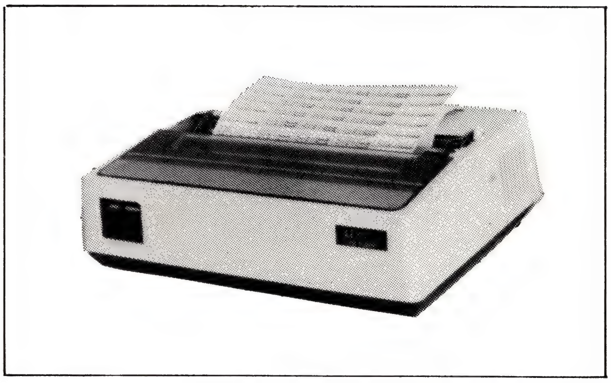


Features

- UP TO 32K USER RAM
- 5" DISK DRIVE
- 8 COLOUR VIDEO DISPLAY
- RS232C PRINTER PORT
- FULL GRAPHICS DISPLAY

MICROLINE 80

IMPACT PRINTER



Features

- FULL ASCII UPPER & LOWER CASE
- FULL GRAPHICS
- 80 CHARACTERS PER SECOND
- 9 x 7 DOT MATRIX
- 80 or 132 CHARACTER LINE

$ THE LOGIC SHOP PTY. LTD.

212 HIGH STREET, PRAHRAN, 3181 (03) 51 1950
91 REGENT STREET, CHIPPENDALE, 2008 (02) 699 4910

Further questioning, and/or reading, will reveal that if your pieces are getting in each other's way they will not be able to do very much, whereas if they have plenty of scope to move they will be more likely to help you improve your position; thus it is important for your pieces to have as many moves as possible.

Everyone knows that the king is the most important piece in chess, so obviously one should look after one's own king. Expert advice will tell you to keep it away from the centre of the board until the final stage of the game has been reached; castle during the opening stage so as to put your king nearer a corner, where it will be safer than on its original square; and don't rashly advance the pawns in front of it once you have castled. You can learn all this from any decent book on the game.

A fifth feature, whose importance is often underestimated is pawn-structure. Good chess players know that "isolated pawns", that is pawns which do not have any supporting pawns on adjacent columns, are weak, because if the opponent attacks them they can only be defended with something more valuable than a pawn, and it is always best to use your less valuable pieces for defence. Also, it is usually a disadvantage to have "doubled" pawns, i.e. two of your own pawns, one in front of the other, since they will not be able to defend each other and the front one will block its colleague's path.

To summarise this stage of function building: Read some good books on the game and try to get advice from a strong player. You need to know which features in a position are important, and you need to understand why they are important so that you can measure roughly how much of each feature is present in a position.

Quantifying the features

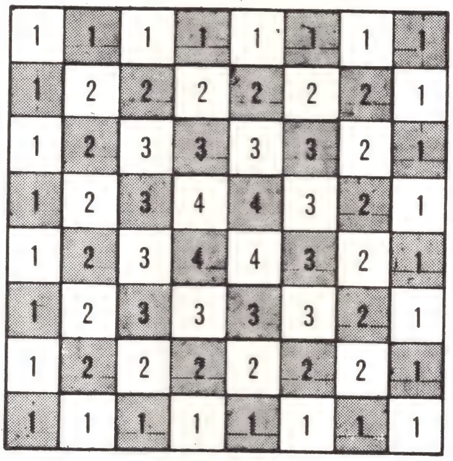
I have already explained how to measure the material situation in a chess position. The scale of values: queen=9, rook=5, bishop=knight=3, pawn=1 is a very useful guide. Some programmers find that giving the bishop a value between 3 and 3½ leads to a more accurate assessment, but it is useful to work with integer values since integer arithmetic is faster than floating point. So if you do decide to use non-integer values, scale everything up so that the final calculations are all integer.

These values of 9, 5, 3 and 1 are known to work well, though there is no logical explanation as to why they are better than some other set of values. It has simply been shown, throughout the modern history of chess, that a knight is worth roughly three pawns, but that a player with four pawns is better off than a player with a knight, while the man with only two pawns will probably lose to the man with the knight.

Features other than material are not so easy to quantify. This is probably because the material count is something that can be performed quickly by anyone who can add, while a count of (say) the number of squares that your pieces attack is not an easy matter for a human player to accomplish when thinking ahead. Because human players do not use any method of quantifying centre control, mobility, etc., when playing games against each other, there exists no well-tested set of values for these features. We must therefore devise our own.

In an earlier article I gave a simple evaluation function for solving the 8-puzzle. Since the object of the exercise is to move tiles from their present location to some target location, it seems logical to measure the merit of a configuration by summing the straight line distances that the tiles need to be moved before they will all be on target. Similarly, for any feature in any other game, we look for a logical explanation of why that feature is important, and this will often lead us to a possible method of quantifying the feature. In chess, as we have discovered, control of central squares is important because from the centre of the board a piece exerts more influence (i.e. it attacks more squares) than it does from an edge or corner square. So to determine the relative values of the squares, from the point of view of centre control, we should, perhaps, count how many moves can be made by each piece, on each square, when the remainder of the board is empty. Of course the remainder of the board is never empty, and sometimes it is very cluttered, but this approach does have a logical foundation and provides us with a first order measure of central square values. A detailed discussion of this method can be found in Jack Good's paper, to which I refer in the bibliography.

Let us assume that we decide to assign square values as follows: each of the four central squares counts 4, those next nearest the centre count 3, the next group 2 and those on the edge of the board count 1. We might then count the total centre control for a player by summing the square values on which his pieces stand, or by summing the values of all the squares that his pieces attack. This may sound like a rather ad hoc statement, but the quantification of features is something of a trial and error process. Since you are a computer programmer you must have a logical mind, so apply some logic to the feature in question and you will come up with a quantification that will serve as a useful model.



1	1	1	1	1	1	1	1
1	2	2	2	2	2	2	1
1	2	3	3	3	3	2	1
1	2	3	4	4	3	2	1
1	2	3	4	4	3	2	1
1	2	3	3	3	3	2	1
1	2	2	2	2	2	2	1
1	1	1	1	1	1	1	1

How easy or difficult it is to quantify a feature varies enormously. To take some more examples from chess: mobility (the freedom of movement of the pieces) may be measured simply by counting how many moves each player has at his disposal. In fact mobility is the second most important feature in chess, and if you plot (White's mobility — Black's mobility) throughout a master game, you will almost certainly discover that whoever wins the game has a lead in mobility throughout much of its duration. The two key elements of pawn-structure, isolated pawns and doubled pawns, are also easy to measure — we can simply count them.

But what about king safety? This is not so easy because there are so many aspects of the position to take into consideration. The king is usually safest when it hides behind a few of its own pawns, but when these pawns advance they offer considerably less protection. A king is normally much safer near a corner of the board, but not if the opponent has many of his pieces trained on that particular corner. It is usually advisable to castle early in chess, to put the king into safety, but if queens are exchanged during the first few moves it may be better to leave the king nearer the centre, since it will be relatively safe during the middle-game and better placed for the end-game. With so many factors to take into consideration, the quantification of a feature such as king safety can be rather prone to error, but some attempt to do so is essential, so don't be put off if you encounter difficulties of this sort.

Weighting the features

Having decided which features to include in your evaluation function, and worked out a suitable method of quantifying each of them, you must then decide which of them are the most important, and assign some numerical weighting to each, to indicate its importance relative to the other features.

Let us suppose that we are writing a chess program and that we have decided to employ only two features in our evaluation function, material and mobility. We quantify material using the scale of values given above (9,5,3,3,1) and we measure mobility by counting how many moves each side can make from a given position. Let us denote the material difference (program's material — opponent's material) by Ma, and the mobility difference (program's mobility — opponent's mobility) by Mo. If we were to compute a score for a chess position simply by adding Ma and Mo, the result would be unrealistic. The reason for this is that one unit of material (in our case one pawn) is not of equal value to one unit of mobility (a move). A pawn is more valuable than a move (other things being equal) and so we must weight the material feature accordingly, multiplying Ma by some numerical weighting WMa. If we set WMa at 3, we are telling the program that one pawn is equivalent to three extra moves, so if it sees an opportunity to increase its mobility scores by 4, the program would be willing to sacrifice a pawn to do so.

The best method of arriving at a good set of weightings for an evaluation function is to start with values that seem to be in the right range, and then improve these values in the light of the program's performance. With our two featured chess function, if we were to play a number of games we would almost certainly discover that with WMa set at more reliable score than S_p.

Samuel computed, for each such pair of values, the difference, which he called delta. If $S_b - S_p$ (i.e. delta) was positive, then he argued that S_p was in error and terms in the evaluation function which contributed positively should have been given more weight, while features which contributed negatively should have been given less weight. Whenever delta was negative he used the converse argument that features which contributed negatively should have been given more weight, and those which contributed positively should have been weighted less.

Samuel kept note of the correlation existing between the signs of the individual feature contributions (i.e. the signs of A, B and C) and the sign of delta, and he updated these correlation coefficients after every move of a game. He then selected the feature with the largest correlation coefficient (other than material advantage, which is always the most important feature), and he set the weighting for this feature at a presribed maximum value, with the weightings of the other features adjusted in accordance with their correlation coefficients. In fact Samuel set all the weightings to be integer powers of 2, so that if the ratio of two correlation coefficients lay between n and n+1 then the ratio of their feature weightings would be 2^n. (If a correlation calculation gave rise to a negative sign, the sign associated with the weighting itself would be reversed.)

The obvious advantage of Samuel's generalized learning method is that it can be implemented on a microcomputer with little difficulty, because it is not necessary to store an enormous number of board positions. When your program makes a move from the root of the tree, you need only store all the 2-ply positions in the relevant part of the tree together with their backed-up scores. (In chess this would normally be in the region of 36 positions, in checkers probably less than 10). A problem arises when the alpha-beta algorithm prunes off the branch actually selected by the program's opponent, since the relevant 2-ply position will not have been stored, but it is reasonable to argue that this will only happen when the opponent makes a mistake (or a move which the program thinks is a mistake), so such instances could be ignored. More accurately, if the program's opponent makes an unexpected move, before computing its reply move the program could first re-examine the relevant part of the tree from the previous root position, searching along the path represented by the opponent's move. This refinement would permit the program to take into consideration the S_b and S_p comparison for positions which, in the first instance, had been pruned away.

Task for the month

Write a noughts and crosses program, using an evaluation function in which the features are:

c_3: The number of cross' "3-rows" (i.e. the number of rows containing 3 crosses).

c_2: The number of cross' 2-rows (2 crosses and an empty space).

c_1: The number of cross' 1-rows (1 cross and two empty spaces).

n_3, n_2 and n_1: Corresponding features for noughts.

Your program should perform a 3-ply exhaustive search (without alpha-beta pruning) and the evaluation function should start with all weightings equal. Modify your exhaustive search noughts and crosses program ("Task of the Month" in article 3) so that it can act as a sparring partner for the present program, and set the two programs playing each other. After every move of every game, the 3-ply search program should modify its weightings using Samuel's method. After each game, print out (or display, if you have no printer) the result of the game and the new weightings in the evaluation function. Observe how the 3-ply program improves its performance.

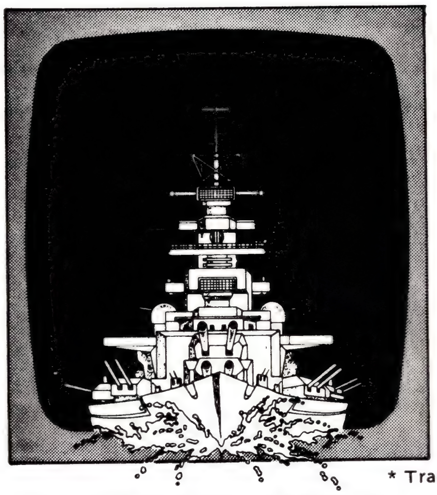
Bibliography

Chambers, R.A., and Michie, D: *BOXES: an experiment in adaptive control.* Machine Intelligence 2 (Ed. Dale, E. and Michie, D.), Oliver & Boyd, 1968, pp. 137-152.

Good, I.J.: *A five-year plan for automatic chess.* Machine Intelligence 2 (ed. Dale E. and Michie, D.), Oliver & Boyd, 1968, pp. 89-118.

Samuel, A.L.: *Some Studies in Machine Learning Using the Game of Checkers.* I.B.M. Journal of Research and Development, vol. 3, 1959, pp. 211-229. (reprinted, with minor additions and corrections, in Computers and Thought, edited by Feigenbaum and Feldman, McGraw-Hill, 1963).

WE MAKE THE BISMARCK COME ALIVE ON YOUR TRS-80*!



OR YOUR APPLE.

* Trade Mark of Tandy Corp.

MS Microsoftware proudly announce the Australian release of a true historical wargame for your home computer — COMPUTER BISMARCK.™ It accurately simulates the epic battle between the awesome German battleship and the British Home Fleet . . . with you at the helm!

Available on cassette for TRS-80 16 and 32K Level II and on disc for Apple II 48K (Applesoft ROM). Both versions feature:

- Computer-controlled mapboard of the North Atlantic.
- Step by step computer-regulated play.
- Hidden movement.
- Ship vs. ship combat and shadowing.
- Historical setup of battleships, cruisers, and carriers.
- Firepower and damage.
- Two-player and solitaire scenarios.

The Apple Disc Version also features:

- Submarines, destroyers, and convoys.
- Land-based aircraft.
- Weather and fog.
- Fuel restrictions and refueling at sea.

TRS-80 Cassette Version: $59.95 **Apple Disc Version: $69.95**

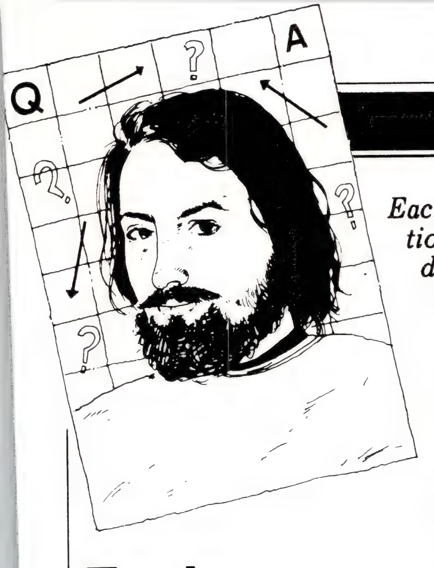
To order today, send cheque or Postal Order to:

P.O. Box 119, Essendon, Victoria 3040.
MS Microsoftware, Beryl Street, West Essendon, Victoria

Please send a SAE, for further details of COMPUTER BISMARCK™ or the soon to be available, COMPUTER AMBUSH™.

COMPUTER BISMARCK™
There's never been anything like it.

If we are unable to process your order within fourteen days, your cheque or postal order will be returned.



COMPUTER ANSWERS

Each month Sheridan Williams and his panel of consultants answer readers questions. Topics may be hardware — from kits to mainframes, or software — from differential equations and statistics to file handling or sorting; the choice is yours.

Touchy technology

I know that mainframe computer installations are always air-conditioned. Would this also benefit my micro? Are there any other similar special conditions that are desirable for microcomputers?
K McGregor, Dundee.

Your question reminds me of the (true) story of one of the smaller mini-computers. Being aware of the air-conditioning needs you mention, the manufacturer was asked if its machine needed any special conditions or surroundings. "Just a normal office environment" was the answer. Came the day that the Installation Engineer arrived to size up the computer's future location, prior to delivery. "You can't put it in here!" he said, "With a South aspect" . . . "And where's the air-conditioning?"

When they thrust the bit about "just a normal office environment" in front of him, he said "but you must realise that we are an American Company!"

There was a happy ending, for it turned out that the air-conditioning was only partly for temperature control, it's other main function was to hold down dust levels. The machine was put in a room on the other side of the building — with a North aspect — the carpet was removed and all was well.

Now all this has two lessons for us microcomputer users. Firstly, that precise temperature control is not vital. What is important is to make sure that all the parts of the system are at the same temperature before use; that not only means *not* blasting a fan heater at the keyboard and expecting it to warm through instantly, it also includes all other parts of the system — tapes, discs, etc. Preferably, they should all have been in the same room for at least half an hour before use . . . longer if possible.

The other thing about temperature is the need to stop parts of the system suffering from their own manufactured heat. If the unit incorporates a cooling fan you should have no trouble (except during heat-waves!) but if it does not, then overheating — especially during long sessions — may account for inexplicable problems. The answer is to provide some kind of cooling fan yourself.

Why was the carpet taken up? Well, that particular system had hard discs (the removeable type), and these are very sensitive to dust. Floppy discs are not so affected, while tape will probably be quite happy in the average home environment. Also, carpets are breeders of static electricity and that's something which will cause errors if it gets near any kind of computer. One solution is to have a special 'anti-static' mat by the machine. Another is to have a convenient water-pipe or other electrical 'earth' by your computer (*don't* use the earth pin of a plug). Just touch this as you come up to your machine, and most static problems will be removed.

Probably the biggest environmental problem with microcomputers is interference through the electricity mains. This takes two common forms. Firstly, there can be voltage fluctuations, not only due to variations in the supply voltage (these are usually small, and slow to change), but also because some fairly large unit on the same circuit has just switched itself on or off. Deep freezes and ovens are well-known culprits.

The second form is even worse in terms of what it can do, especially if you have a program actually running at the time. This is the so-called 'mains spike', a sudden, brief, sharp increase (or sometimes decrease) in the voltage. These are also often caused by equipment being turned on, or more often, off. Fluorescent lamps are one of the main sources. Not only can this kind of interference travel down the mains lead, — it can also travel short distances through the air — as a magnetic field. So try to keep your equipment away from sources of 'spikes', and fit 'mains filter' units in the power lead if you are still troubled by them. Differing microcomputers are affected to varying extents, depending on the amount of built-in mains filtering they have.

One last point. Keep all your tapes and discs well out of the way of magnetic fields, whether from actual magnets, passing vacuum cleaner motors, or even screw drivers (which have a curious tendency to become quite strongly magnetised all on their own!). One of the best solutions is to keep them in a steel filing cabinet or cupboard . . . even a biscuit tin might do very well, always providing they don't make them out of aluminium these days!
P McIlmoyle

Routine suggestion

Can you suggest a routine for calculating the number of days between two given dates, either in the same year, or more cleverly, between different years.
L N Parlett.

The following program works, but you must have previously validated the dates; so, provided they are legal, this will work for any two dates between 1/3/1901 and 28/2/2400. (Can you see why it won't work outside this range?)

The year should be input in full. Some versions of Basic represent logical 'true' as a -1, some as 1. If you try PRINT 2<3 in direct mode and get -1 printed then use the bottom symbols; if you get 1 then use the top ones.
SW

```
10 INPUT “FROM”;D1,M1,Y1
20 INPUT “     TO”;D2,M2,Y2
30 A=INT(365.25*(Y1±(M1<3)))+INT(30.6*(M1+1±(M1<3)*12))+D1
40 B=INT(365.25*(Y2±(M2<3)))+INT(30.6*(M2+1±(M2<3)*12))+D2
50 PRINT ABS(B-A),“Days”
```

"Take no notice of Jim, he's playing strip poker with his computer."

GATEWAYS TO LOGIC

CHAPTER 2: ON TO BOOLEAN ALGEBRA

Derrick Daines, recapping his past, continues his unique guide to teaching others the basics of microcomputing.

When I was in my teens I 'discovered' the public lending library. It was only half a building — the other half had been destroyed by bombs — and tar-paper was nailed up to keep out the wind and rain. I haunted the place. In there I had uncovered the wonderful world that lay beyond the war-torn streets of Grimsby. Not for me the fantasy of fiction, for I had found the non-fiction shelves and the world of fact to be fairytale enough.

One day I happened to come across the name of one George Boole (1815-1864), a Lincoln mathematician, who was apparently one of those able but slightly eccentric men that the Victorians threw up in abundance. He had written a few obscure papers, a book on symbolism and had even been awarded a medal by the Royal Society in 1844. I felt more than a passing interest. At that time I sang in a church choir and the name of the incumbent was a Reverend Boole. I knew that Rev Boole came from Lincoln and as Boole was not a common name, I reasoned that there was probably some connection.

Accordingly, on the next Sunday I asked Rev Boole if he had had a relative called George who was a mathematician. Oh yes, he said off-handedly, that was his grandfather. He of course had never met him, but he did know that his grandfather had started a school in Lincoln and the story in the family was that after school, George used to potter about upstairs in his little study, 'doing things', but nobody quite knew what. Nobody took much notice of it, he said. There was a faint air of fond indulgence and the conversation lapsed.

About 20 years later, having been abroad for some time, I arrived back in Grimsby and stepped out of the station to be confronted by a newsagent's placard which read, "Local Grandson of Famous Scientist!" My mind leapt the intervening years to that brief conversation with the vicar. Quickly I bought a paper and sure enough, there on an inside page was a photograph of Rev Boole alongside an account of his grandfather's work; it had now become known world-wide as Boolean Algebra.

What had happened? What had lifted George Boole's work from near total obscurity into world-wide prominence — almost a hundred years after his death? In a word, the computer had happened. George had had the wholly original idea of reducing a statement made in English to a single algebraic letter so that it could be manipulated in a manner similar to numeric or ordinary algebra. At the time the idea had had little, if any, practical use but when the computer materialised it was found that the two complemented each other perfectly. Not only was the computer able to manipulate the most complex Boolean statements with consummate ease, but Boolean Algebra also presented the best possible method of describing computer action — a method moreover that could be understood by engineers the world over. It transcended language barriers the same way as mathematics; anyone could understand it, no matter what their native tongue. Not bad for one man's slightly eccentric ideas carried through in his spare time!

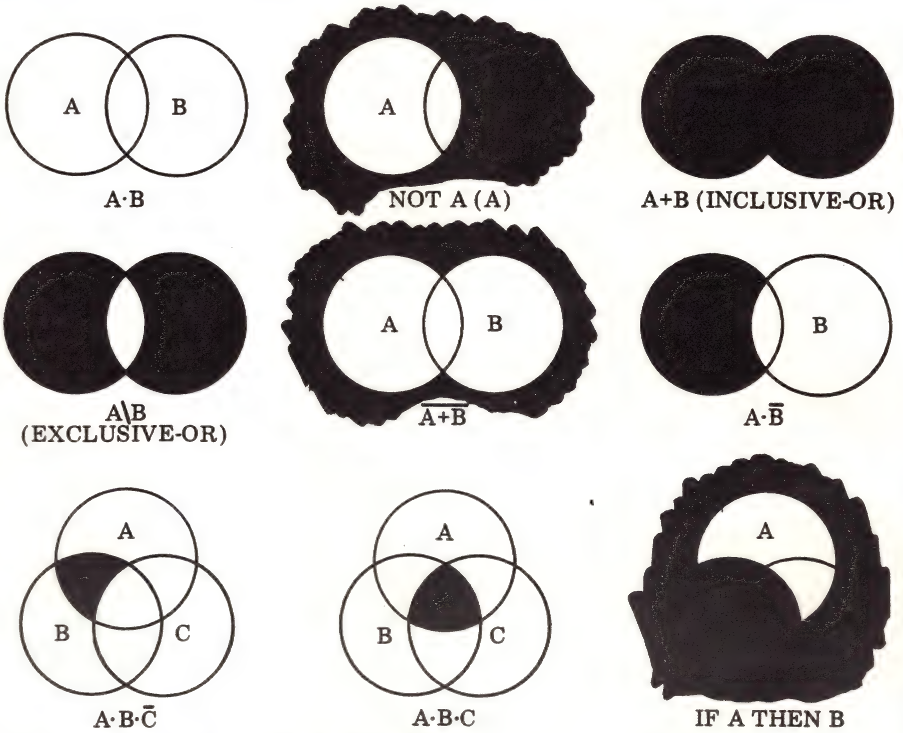
Think back to Venn diagrams. Instead of labelling one hoop RED, meaning 'All blocks that are red are inside this circle,' if we label it 'A', then we have taken the first and most fundamental step towards understanding Boolean. Similarly, a second hoop could be labelled 'B', meaning 'All blocks inside this hoop are large.'

A dot placed between two letters is by convention read as AND, so the statement for the overlapping area of two hoops is A.B which means, 'All blocks in this area are both red and large' (Fig 1).

$\bar{A}$ is read as NOT A and is taken to be shorthand (in our example) for 'All blocks in this area are not red', or if you prefer 'No block in this area is red.' The OR statement is a little tricky — take for example 'boys or girls are allowed in'. Do we mean boys only or girls only, or do we mean boys and girls? In fact we use both definitions in common speech, frequently interchanging them as necessary to suit our purpose. To prevent confusion therefore it's wisest never to use OR on its own, but rather always to preface it with the conditional 'exclusive' or 'inclusive'. Exclusive-or of course excludes the possibility of having both attributes at once, while the Inclusive-or allows for this possibility.

Unfortunately there has not until recently seemed to be much common ground in the use of symbolism for either the inclusive-or or the exclusive-or. Mathematicians have used one symbol, industry another and the writers of books on 'sets' yet a third. Moreover, some of these symbols have been subject to change over the years so that switching from one text book to another can be a little confusing. In this series I shall use the addition sign (+) for the inclusive-or and the shorthand term 'ex-or' for the exclusive variety.

'If A then B' or, as it is sometimes called, implication, may be confusing or difficult to understand for some (Fig



$A \cdot B$

NOT A (A)

$A+B$ (INCLUSIVE-OR)

A\B (EXCLUSIVE-OR)

$\overline{A+B}$

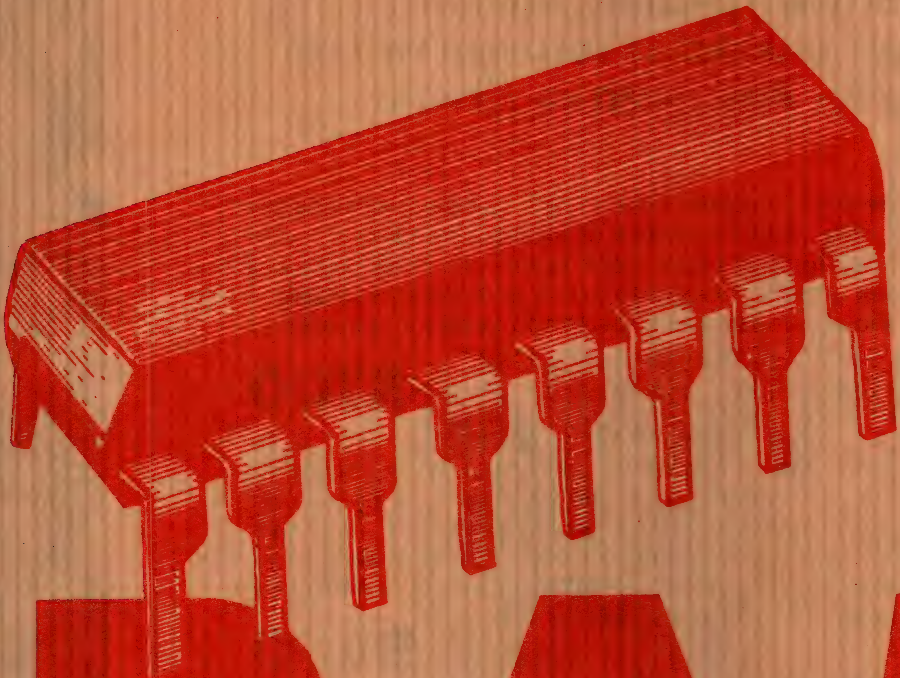
$A \cdot \bar{B}$

$A \cdot B \cdot \bar{C}$

$A \cdot B \cdot C$

IF A THEN B

Fig. 1 In each case, the shaded area represents the truth of the statement



EXTRA

UGH • PRICE BREAKTHROUGH • PRICE BREAKTH

SUIT TRS 80

SORCERER
APPLE

RAM

EXPAND YOUR MEMORY AT AN INCREDIBLY LOW PRICE

16K RAM — $59.95* •200ns
32K RAM — $114.00* •Available now

* Installation $20.00 extra for 16K

bankcard
welcome here

Just ring with your Bankcard Number and Expiry Date and we will immediately forward goods.

POSTAGE IS INCLUDED AT NO CHARGE, HOWEVER WE SUGGEST REGISTRATION OR CERTIFICATION.

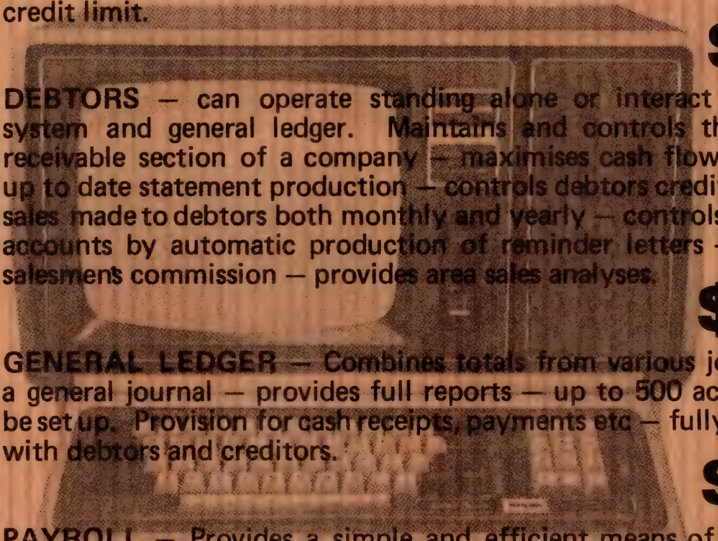
26 STATION STREET, NUNAWADING, VIC. AUSTRALIA
Tel: (03) 877 6946, 878 9276

MODEL 2

Deforest Software proudly announce a fine range of fully interactive software written in Australia for Australian conditions.

INVOICING WITH STOCK CONTROL — Will maintain and control stock levels, produce a detailed invoice or credit note on line — will analyse sales and profitibility of all stock lines — analyses sales and profitibility of stock groups. Fully interactive with debtors system — during invoicing shows current stock levels and details and customer credit limit.

$700



DEBTORS — can operate standing alone or interact with stock system and general ledger. Maintains and controls the accounts receivable section of a company — maximises cash flow by prompt up to date statement production — controls debtors credit — analyses sales made to debtors both monthly and yearly — controls delinquent accounts by automatic production of reminder letters — calculates salesmen's commission — provides area sales analyses.

$500

GENERAL LEDGER — Combines totals from various journals into a general journal — provides full reports — up to 500 accounts may be set up. Provision for cash receipts, payments etc — fully interactive with debtors and creditors.

$500

PAYROLL — Provides a simple and efficient means of automating a company payroll — 400 employees or 800 per double density disk — can be broken into cost centres and caters for weekly, fortnightly and monthly pay periods — provision for cash includes coinage, cheque and bank transfer — a total of 20 allowances or deductions are provided for either before or after tax — 10 rates of pay.

$700

These programs can be sold separately or as part of a complete computer system, from as little as **$8200** (depending on options).
The lease amount on this figure is only **$45.40** (PER WEEK)

Fully Interactive Business Programmes

Word Processing deForest Style

Using the best in word processing software the **Magic Wand**™, the best in letter quality printers the **DIABLO**, and the well-known **TRS-80**™ **MOD II.** You have looked and looked for the best and now it is available from the **Complete Computer Company, deForest Software.** Word Processing at its best from $10,400.

Magic Wand available separately for the MOD II and other computers $450.

Why buy a dedicated word processor when for less money you can have a complete computer system!!

deForest Software
26 Station Street, Nunawading, Vic., 3131. Phone.: (03) 877 6946

Magic Wand is a trademark of Small Business Applications, and TRS-80 is a trademark of Radio Shack.

BUSINESS NEWS

Microcomputers like the TRS-80* are really elegant pieces of hardware. The price is deceiving. Given the right programs, they can jump through hoops.

But finding the right program isn't all that easy. You can flip through pages of this magazine and find many ads for TRS-80 programs. Granted a good many of them are for fun and games, but you can still find quite a few offering business programs.

They aren't like these though.

Three of these are the genuine Osborne & Associates systems, originally designed for the $30,000 Wang computer. With a few minor modifications on them, they now work on a $4,000 TRS-80.

Here's what's on each disk:

FOUR ON-LINE, INTERACTIVE OSBORNE PROGRAMS

Accounts Payable: an invoice linked system that can calculate and print cheques, make reports and link fully to the general ledger.

Accounts Receiveable: also invoice-linked, it can keep track of billed an unbilled invoices, open and closed items and aging. It can print a statement and link to the general ledger.

General Ledger: this handles more than 1,750 transactions on 200 different accounts and keeps track of them by month, quarter, year and the previous three quarters. Available with or without Cash Journal option.

Invoicing: A completely interactive program that works with accounts receivable and will print your invoices.

ANOTHER USEFUL BUSINESS PROGRAM

Inventory Control: a custom-tailored program that looks after up to 1300 items — it gives an immediate readout on any item inquiry, including quantity and dollar total.

These programs are marvels of efficiency. They're fully documented, and you can buy the books from me.

These programs only cost $99.95 each. (The Cash Journal option on the General Ledger adds another $50.) For that you get the disk and all the instructions you need.

We plan to turn that TRS-80* os yours into a serious computer.

Please send me the following programs at $99.95 each:

		book
Accounts Payable		
Accounts Receivable		
General Ledger (add $50 for Cash Journal)		
Invoicing		▨
Inventory Control		▨
AMOUNT ENCLOSED		

If you need the books, add $20 each.

Bankcard No. ______________ Expires ______

Builders Job Cost Program. Requires 3 disks, 32K, TRS-80. Keeps complete control over your costs, handles 100 jobs, estimates, sub-contractors etc.

$200

Real Estate Investment Analysis. Requires 32K, TRS-80* Disk and Printer — Use this program to predict your investment potential on flats, second homes, holiday homes, main homes etc. Gives figures up to 20 years in the future; takes into account inflation etc.

$35

Basic Compiler. TRS-80*. Disk 32K. Turn your basic programs into fast Z80 code — Protect your programs.

$202

Accounts Receivable/Accounts Payable.

Now, in one package, you can have a *complete* Accounts Receivable/Accounts Payable (AR/AP) system! These programs will handle all the drudgery involved in processing AR/AP entries.

Each program is capable of handling up to 760 accounts and as many as 1500 entries per month.

The Accounts Receivable program can print invoices, statements, and address labels for each customer.

The AR/AP package is ideal for any small business. The programs are self-prompting and are easily used by anyone familiar with AR/AP operations.

These programs can save you money, because they can print your company's letterhead at the top of each invoice and statement, using plain, fan-folded paper.

Accounts Receivable/Accounts Payable: Software for the Professional.

TRS-80* Model 1, Level 2. $210.00

Mail List. Requires at least 1 drive. Stores 650 names on diskette - can use up to 4 drives.

only $30

Linear Digression Disk. Permits interactive entry of up to 10 independent variables and as many observations as memory permits.

$49

C.P.M. 1.5. Disk operating system for Model 1 TRS-80*

$150

Electric Pencil. Turn your TRS-80* into a top quality word processor.

Disk $150; Cassette $100

Super Script (Scripsit enhancement package). Allows operator to kill and obtain a directory from scripsit, also underlying bold face set 10 or 12 pitch. Complete with serial or parallel drivers (a must for script users)

$25.00

Landform Programming. Program to determine earthworks associated with landforming. Req. 32K, 1Disk drive

$1,000; Complete system $5,000.

Farm Management Program. **$500.00**

NEW BOOKS

LANGUAGES

Learning Basic Fast	$10.95
Basic Primer	$11.95
Basic for Everyone	$17.50
Basic Programming Self Taught	$12.95
Basic Programming for Business	$17.50
Introduction to TRS-80 Level 2 Programming	$14.75
Basic Made Easy	$13.50
Cobol for Students	$17.50
Programmming in Structured Cobol	$21.50
Cobol, a Pragmatic Approach	$19.75
Primer for Pascal	$14.75
Strctured Progamming & Problem Solving with Pascal	$18.95
Introduction toPascal	$13.95
Fundamentals of Fortran	$15.95
APL - A Short Course	$15.50
Structured Programming with PL/ONE	$16.95
SNOBOL 4 Programme Language	$18.25

GENERAL

Computer Fraud & Counter Measures	$39.95
A Collection of Programming Techniques	$19.95
Word Processing	$19.95
Introduction to Word Processing	$19.95

INTERFACING

TRS-80 Interfacing	$11.95
280 Interfacing Book 1	$29.75
280 Interfacing Book 2	$29.75
Interfacing the 6502	$15.95
Microcomputer Interfacing	$25.75

★ *Used & Demo TRS-80's (Model 1 and Model 2) in stock; also disks, expansion interfaces etc.*

DEFOREST SOFTWARE

**TRS-80 is a Trademark of the Tandy Corporation.*

GAMES

TRS-80* (MODEL 1)

Sargon 2 — The ultimate Chess Game for any Microcomputer 16K Level 2	**$37.50**
Microchess — Level 1 or 2 TRS-80. Plays an entertaining game 3 levels fits in 4K	**$24.00**
Golf & Crossout — New improved version, good graphics. You can even design your own championship course	**$10**
Santa Paravia — up to 12 can play, become the king of a medevil city, levee taxes	**$10.00**
Battleground — The stark reality of World War II comes alive in this program	$12.50
Game Playing with Basic — 3 tapes 1, 2 & 3 based on the book of the same name great for learning	**$12.50 ea.**
Oil Tycoon — 2 players, explore, drill for oil, cutprice the opposition, force him into bankruptcy	**$10.00**
Space Trek IV — population simulation, trade or wage war send missions to space, can you survive?	**$10.00**
Checker King — not just an ordinary checker game but a fast expert machine language challenge.	**$27.00**
Flight — Control your own aircraft, very realistic, good flying simulation and very challenging	**$10.00**
Jet Fighter Pilot — Takes you as close to real combat fighting as possible. A brilliantly realistic simulation	$19.95
Airmail Pilot — an entertaining game can you get the mail through in your 1927 Biplane, watch for lightening, windstorms, fuel shortages etc.	**$10.00**
Night Flight — a new exciting game from Instant Software	$12.50
Flight Path — from Instant Software	$12.50
Adventures — what more can be said! The most challenging simulation/game/adventure ever Nos. 0 to 9.	**ea. $16.00**
1 on Disc	**$19.00**
2 on Disc	**$32.00**
3 on Disc	**$39.00**
Backgammon/Keno — 2 great gambling games from instant software	**$10.00**
Mind Warp — A series of great programmes	$12.50
I.Q. Test — See how smart you really are	$12.50
Olympic Decathlon by Microsoft	**Disk $29.00; Cassette $29.00;**
Bandito — Your TRS-80 a slot machine with great sound effects	**$12.50**
Star Trek — Acorn a space adventure on your TRS-80	**$12.50**
Stock Market — Invest in safe stocks or high risk specs. will you take the risk	**$12.50**
Original Adventure — requires 32K & disc from Microsoft.	**$35**
Monolopy — Play that famous game against the TRS-80.	**$10**
Time Trek — with sound, another of the 'classics' for the TRS-80 real time excellent programme	**$21.00**
Galactic Empire — a space game with a difference, many hours enjoyment with this one.	**$16.00**
Cosmic Patrol (with sound) — WARNING! Players of this game should be prepared for a state of realism hitherto unavailable on theTRS-80	$19.95
Light Pen — games and instructional program includes game frogs (Light pen not included)	$10.00
Space Battles — requires 32K 1 disc	**$15.00**
Games 20 — only 75 cents per program on disk	**$15.00**
Pinball — the greatest game that I have ever seen for the TRS-80, fast action movable flippers and great sound. Machine language, maintains high score Disk.	**$20**
Tape.	**$16**
Super Space Invaders with Sound — nothing like the normal invaders extra fast. Spray bullets like out of a hosepipe, not only does the enemy move sideways but they also advance Disk	**$20**
Tape	**$16**
Space War — A 2 pleyer real time space battle; 5 modes, 2 speeds	$12.50
Ultra Trek — A Star Trek theme in a challenging adult version	$19.95
Lying Chimps with Sound — a very interesting program	**$10**
Chessmate 80 — This programme forced a draw with Sargon 2	$24
Othello — An old favorite	$12.50
Typing Teacher —	$10
Your Cribbage & Checkers Partner	$12.50
Quad — A tic-tac-toe strategy game with a difference	$12.50

TRS-80* (MODEL 2)

CPM Version 2.1	$210.00
WORD STAR — "The Ultimate Word Processor" (requires C basic and CPM)	$420.00
C Basic 2	$120.00

The following business programs are fully interactive and written for Australian conditions.

Creditors	$400.00
Debtors and Invoicing	$500.00
Order Entry/Invoicing/Stock Control	$700.00
General Ledger	$500.00
Payroll	$700.00
Direct Mail	$700.00

PET

TREK X with sound (for R&T)	$10
Backgammon and Keno	$10
Space Trek 2.	$10
Code Breaker with sound	$17 40
Gammon Challenger — 3 levels of play	$17.40
Barricade — "Machine Language Arcade Game"	$10.00
Backgammon — Machine Language	$16.00
Some common basic programmes.	$17.50
Dungeon of Death	$10
Chimera	$12.50
Santa Paravia	$12.50

APPLE

Golf	$10
Bowling - Trilogy	$10
Oil Tycoon.	$12.50
Sahara Warriors	$10
Space Wars	$10
Air Flight Simulation	$12.50
Santa Paravia	$12.50
Math Fun — Change an Apple computer into a mathematics tutor and change boredom into enthusiasm (all programs in this package run in Applesoft basic except whole space which requires Integer Basic)	$25
APPLE FUN comprising MIMIC, FLIGHT SIMULATION, COLOURMASTER, STARSHIP ATTACK and TRILOGY (Apple II or IIplus - 32K - 1 Drive - Mimic requires Applesoft in Rom)	$25
Conflict — a marvellous war game, requires disk; 32K Ram and Applesoft	$25.00

COMPUTER BOOKS

Basic Basic	**$11.00**
Advanced Basic	**$11.00**
Basic from the Ground up	**$11.00**
Basic Work-book	**$7.50**
Discovering Basic	**$8.50**
Common Basic Programs	**$12.50**
Sargon Chess	$19.00
How to Build a computer controlled Robot	$15.00
How to profit from your personal computer	$11.00
An Introduction to Microprocessors 0	$11.75
" " " " 1	$12.50
Z80 Programming for Logic Design	$12.50
Z80 Assembly Language Programming	$13.60
Pay Roll & Cost Accounting* *(Software to match $99)*	$20.00
Account Payable & Receivable* *(Software to match $99)*	$20.00
General Ledger* *(Software to match $99)*	$20.00
6502 Assembly Language Programming	$13.60
The 6800 Microprocessor	$11 00
Basic Microprocessors & the 6800	$16.00
Computer Mathematics	$16.00
Consumers guide to personal computing & Microprocessors	$11 00
Mini Computers, structure & programming	$18 00
Fundamentals & Applications of Digitallogic circuits	$13 00
Small Computer systems Handbook	$11 50
The first book of Microcomputers	$6 50
Computers in Society	$9.50
Computers in Action	$7.00
Standard Dictionary of Computers	$25.00
Programming Programmable calculators	$13.50
110 Basic Computer Programs	$8.00
Cobol with style	$9.50
Basic with style	$8.00
Fortran with style	$9.50
Pascal with style	$8.50
Programming Proverbs	**$9.50**
Fortran Fundamentals	**$6.50**
Fortran 4 Programming	**$9.00**
Microcomputer System Design	**$21.00**
Microprocessor Data Manual	**$10.00**
Microprocessor Basics	**$16.00**
S-100 Handbook	**$10.00**
Digital experiments	$11.00
Digital Trouble Shooting	**$12.50**
Telephone Accessories	**$7.50**
More telephone accessories	**$7.50**
Logical Design Using IC's	**$24.50**
Statistical Pattern recognition	**$21.50**
Fundamentals of Data Base Systems	**$21.00**
40C Ideas for Design Vol 3	**$18.50**
Integrity & recovery in Computer Systems	$12.50
Management of Information Systems	$11.00
File Structure for On-Line Core Systems	$18.50
Data Management for On-Line Core Systems	$18.50
Digital Signal Analysis	$27.00
Computer Security Risk Analysis	$16.00
Character readers & Pattern recognition	$17.50
Modern Electronics Security Systems	$16.00
Printed Circuit Assembly	$6.50
Basic Mathematics Vol 1	$8.50
Vol 2	$8.50
Mathematics for Electronics	$9.50
Human Communication Handbook Vol 1	$12.00
Vol 2	$12.00
Computer Dynamics	$13.00
Computer Aided Design Techniques	$32.00
Electronic Game Projects	$6.00
TRS-80 Disk and other Mysteries "Pennington" *Now in stock.	$25.00

★ *NEW!! Z80 soft card $365.00 (run Z80 programs on your APPLE).*

Tandy Tips from Peter deForest

1. Instead of using the code published in Radio Shack's Editor/Assembler Manual to clear the screen, try:

```
CALL 01C9H
```

(a routine in the Level II ROM to clear the video display)

2. To execute a pause in machine or assembly language use the following assembly language program which uses another ROM routine with an entry point of 0060H:

```
PUSH BC                 ; save contents of BC pair
LD    BC, dddd H        ; load BC with length of pause
                          (1000H approx. equals 0.1 recs)
PUSH AF                 ; save contents of AF pair
CALL 0060H              ; pause routine
POP   AF                ; restore AF pair
POP   BC                ; restore BC pair
```

3. The Level II manual doesn't specifically mention the fact that the formats used in PRINT statements may be combined. For example, the following statement is perfectly legal:

```
PRINT @ A, TAB(B); USING "number is ##.# "; C
```

4. Level II uses this shorthand

Compliments of Joe Deutsch, the following represent Level II tokens for system commands.

These tokens are used to save space in storage of Level II commands.

As character codes 128–255 are used for graphic commands and will not be present in Basic statements, this range of values can be used to store one character values representing the following commands. You can look at the values stored by doing some experimentation with PEEKs after finding the program storage area in RAM.

128 END
129 FOR
130 RESET
131 SET
132 CLS
133 CMD
134 RANDOM
135 NEXT
136 DATA
137 INPUT
138 DIM
139 READ
140 LET
141 GOTO
142 RUN
143 IF
144 RESTORE
145 GOSUB
146 RETURN
147 REM
148 STOP
149 ELSE
150 TRON
151 TROFF
152 DEFSTR
153 DEFINT

154 DEFSNG
155 DEFDBL
156 LINE
157 EDIT
158 ERROR
159 RESUME
160 OUT
161 ON
162 OPEN
163 FIELD
164 GET
165 PUT
166 CLOSE
167 LOAD
168 MERGE
169 NAME
170 KILL
171 LSET
172 RSET
173 SAVE
174 SYSTEM
175 LPRINT
176 DEF
177 POKE
178 PRINT
179 CONT

180 LIST
181 LLIST
182 DELETE
183 AUTO
184 CLEAR
185 CLOAD
186 CSAVE
187 NEW
188 TAB
189 TO
190 FN
191 USING
192 VARPTR
193 USR
194 ERL
195 ERR
196 STRING$
197 INSTR
198 POINT
199 TIME$
200 MEM
201 INKEY$
202 THEN
203 NOT
204 STEP
205 +

206 –
207 *
208 /
209 ↑
210 AND
211 OR
212>
233 =
214<
215 SGN
216 INT
217 ABS
218 FRE
219 INP
220 POS
221 SQR
222 RND
233 LOG
224 EXP
225 COS
226 SIN
227 TAN
228 ATN
229 PEEK
230 CVI

231 CVS
232 CVD
233 EOF
234 LOC
235 LOF
236 MKI$
237 MKS$
238 MKD$
239 CINT
240 CSNG
241 CDBL
242 FIX
243 LEN
244 STR$
245 VAL
246 ASC
247 CHR$
248 LEFT$
249 RIGHT$
250 MID$
251
252
253 } ?
254
255

5. Blinking Cursor;

Compliments of Peter Zieger;

Here is one solution to the problem of obtaining a blinking cursor. The cursor can even be changed to any character desired including graphics. (Those of you with the upper/lower case video modification have some really neat ones from 0 to 31 decimal). The ability to use any character opens up possibilities not present before. For example, on an input of 3 fields you could make the cursor blink A '3'. As a hidden bonus if the cursor is in the blink mode when the computer enters a lengthy calculation or a delay loop the cursor will still continue to blink (but at a much slower rate) to signal to you that your little number-cruncher is indeed still running and it hasn't committed suicide or something.

The routine can be added to your program or be run separately before you load your program, however you must have given the appropriate memsiz reply on power-up. You control the cursor mode and character with simple poke statements:

Tandy Tips from Peter deForest

POKE CURSR, BLINK
STARTS THE CURSOR BLINKING
POKE CURSR, SOLID
STOPS THE CURSOR FROM BLINKING
POKE CHAR, XXX
CHANGES THE CURSOR TO XXX DECIMAL CHARACTER CODE

The following is the code, however any line numbers may be used since none of them are ever referenced. Lines 100 & 110 must also be included in the calling program when this routine is run before you load your program.

```
100  MMSIZ = 20423 (32711)  4K (16K)
110  CHAR=MMIZ+ 56:  CURSR=MMSIZ+21:  BLINK = 0: SOLID=1
120  PIKE 16553, 255
130  FOR INDEX = 1 to 50
140  READ HEX
150  POKE MMSIZ + INDEX, HEX.
160  NEXT
170  POKE 16526, 217
180  POKE 16527, 79 (127)  4K  (16K)
190  POKE 16414, 200
200  POKE 16415, 79 (127)  4K  (16K)
210  DATA 220, 42, 142, 64, 34, 22, 64, 33, 88, 4, 34, 30, 64, 225
220  DATA 195, 88, 4, 213, 245, 62, 0, 167, 32, 24, 17, 36, 0, 25
230  DATA 53, 32, 17, 35, 53, 32, 13, 54, 2, 35, 126, 42, 32, 64
240  DATA 190, 119, 32, 2, 54, 32, 241, 209, 195, 227, 3, 255, 2, 143
```

6. Ever wonder how to get those extra tracks out of your non-Radio Shack drives without spending more money for a different DOS or a patch to TRSDOS; The answer is simple. Modify TRSDOS for the extra tracks yourself. Easier said than done, you say? If you have a monitor such as RSM2D, which can read and write disk files without regard to the protection status, you are half way there.

First, make a back-up copy of a TRSDOS 2.2 or 2.3 diskette. Make sure it has all the utilities present (BACKUP, FORMAT, etc.) Second, have a blank diskette handy as we will need to make a back-up of the modified TRSDOS diskette. Now we are ready to begin the modifications.

Get into RSM-2D, or whatever monitor you will be using, and insert the back-up of the TRSDOS which you have previously made into drive 0. Since most drives with 40 or more tracks are capable of a faster head stepping rate, we will also modify TRSDOS to step at a 20 millisecond rate, twice as fast as the unmodified TRSDOS. This decreases access time considerably. Load track 0, sector 0 into memory location 5000H (use command L 0 5000 1 for RSM-2D). Change the data at address 50BAH from 1BH to 1AH. Write the sector back to disk ($ 0 5000 1). This changes the stepping rate for the TRSDOS bootstrap routine.

Load track 0, sector 7 starting at 5000H (L 7 5000 1). Change the data at address 5052H from 1FH to 1EH and at 50C5H from OBH to OAH. Write it back to disk ($ 7 5000 1). Load track 1, sector 1 (L 11 5000 1). Change the bytes located at 5096H and 50BEH from 23H to 28H (4DH for 77 tracks). Write the sector back to disk ($ 11 5000 1). The subroutines in which these addresses are contained are part of the main disk driver routine and are used by all TRSDOS functions except BACKUP and FORMAT.

Now we will modify FORMAT/SYS so we can format data diskettes with 40 tracks. Load track number 2, sectors 1, 2, 3, 4 5, and 6 starting at address 5000H (L 21 5000 6). Change addresses 50E6H, 512BH, 513OH, 5202H, 52CDH, 5383H, and 538EH from 23H to 28H (or 4DH). This changes the track count. Now change bytes 52D1H, 54B5H and 5523H from 5BH, 1BH and OBH to 5AH, 1AH, and OAH, respectively. Write all this back to disk ($ 210 5000 6).

BACKUP/SYS comes next. Load track number 3, sectors 1-9 (1 31 5000 9). Change 506EH from 1BH to 1AH and 5751H from 5BH to 5AH. This is the step rate. Now change the bytes at addresses 5634H, 564AH, 574DH, 5802H, 5812H and 581DH from 23H to 28H (or 4DH). Write these sectors back to disk ($ 31 5000 9). Load track 4, sector 0 (L 40 5000 1). Change addresses 5000H and 50A4H from 23H to 28H. Write the sector back to disk ($ 40 5000 1).

Seem tedious? Well, we're almost finished! Load track 18, sector 0 into memory (L 180 5000 1). Change the byte at address 5055H from 23H to 28H (or 4DH). Write it back to disk ($ 180 5000 1). This byte determines how many tracks TRSDOS will check in the GAT (granule allocation table) when looking for free disk space.

Next we will modify the "FREE" command so that it recognizes the extra free tracks. Load track 20, sector 3 (L 203 5000 1) and change the byte at address 507DH from 23H to 28H. Write it back to disk (203 5000 1).

Finally, we must modify the GAT. Because the GAT is written to disk using a different data address mark than normal data, we must modify our monitors to write data with this same address mark. For RSM—2D on a 16K system, change the byte at address 74E1H from A8H to A9H, for a 32K system change B4E1H, and for a 48k system change F4E1H. Load track 17, sector 0 starting at 5000H (L 170 5000 1). Begin at address 5023H and change the next five (42 for 77 tracks) bytes from FFH to FCH. This tells TRSDOS that these tracks are empty. Again, starting at address 5083H change the appropriate number of bytes from FFH to FCH. This tells TRSDOS that these tracks are no longer 'locked out'. Write the sector back to disk ($ 170 5000 1). This completes all modifications to the TRSDOS system.

Because the modified TRSDOS diskette was originally only formatted for 35 tracks, it will not function properly. But, because we modified BACKUP/SYS for the extra tracks, we can make a back-up copy of this modified version that will be formatted for these tracks. Using the modified TRSDOS diskette, as the source and the blank diskette previously mentioned as the destination, make a back-up just as you would any TRSDOS backup. Watch the screen closely and you will notice that during the format procedure, the correct number of tracks will be formatted. After the procedure is finished the new copy will be a fully functional 40 or 77 track TRSDOS diskette. Put it in drive 0, boot it up, and type FREE. How do you like that?

I have used TRSDOS 2.2 and 2.3 with this 40 track modification for almost a year with no errors and can verify its reliability. I have not personally tested a TRSDOS modified for 77 track operation and would appreciate any feedback on this matter.

As a final word of caution, the originally modified TRSDOS diskette will not function properly since the new tracks have not been formatted. It will produce "RECORD NOT FOUND" and "DISK READ ERROR" errors. This diskette must be erased to avoid accidental use.

DEFOREST SOFTWARE

New DOS 80 — The latest and greatest from Apparat, variable length fields to 4K, mix and match drives on 1 cable. 18 to 80 track. Security boot and much more . . . $149.50

New DOS Plus — A very powerful disk operating system, too many features to list. Send SAE for reviews and information . . . . 40 track $110.00
35 track $99.00
77 track $120.00

New DOS — A scaled down version of the above
40 track $55.00
35 track $49.00

Editor Assembler Plus — Microsoft — Very powerful complete with de-bugger. $34.00

Basic Compiler — Create fast Z80 code of your basic programs $202.00

Level 3 Basic — Get all the advantages of disk basic plus many extra features(disk or cassette). $52.00

Assembly Language Package - Complete Macro Assembly by Microsoft. $102.00

Fortran — Microsoft — Fully compatable with TRS-DOS $102.00

Packer — Comes with 16K, 32K & 48K versions; perhaps the best program written in 1979; remove rems & spaces, renumber, move and more — Disk add $5.00. $30.00

Clone 2 — Copies system or data tapes, make backups of your valuable programs. $18.00

Print to L. Print — No Printer? Simply use this program to change all L. Prints to Prints or vice versa, other features. $10.00

System Savers — FLEXI and T DISK put your favorite M/L tape to disk or make back-ups of system tapes. $24.00

Tape based labelling disassembler - this program assigns labels (where appropriate) to the routines in a machine language program. The output is almost identical to hand assembled sources code. Because of the use of labels, it is a simple matter to make changes without loosing track of jump/load addressses $19.95

Disk-based labelling disassembler — as above but for disk systems. $24.95

Utility 1 & 2 — from Instant Software — 2 tapes each $10.00

EDUCATION

SBT — Structure Basic Translator — write basic in a structured format . . . . . disk $23.00

Teacher — Create your own texts store on data file $12.50

French/Italian/German — Each on disk, very powerful language CAI program. . . . . each $23.00

Assembly Language Instruction Course - audio cassettes, program cassette and reference book. Learn Assembly Language the easy way. This course guides you smoothly through the complexity of Assembly Language without difficulty. $70.00

HARDWARE

Speed up now up to 100% faster. Make your machine the fastest on the block (new improved model, now 4 speed) $35.00

Reverse Video — Gives crisp black on white $31.00

Coding Forms . . . . . 2 Pads $8.50

Flow Chart Pads. . . . . 5 Pads $37.50

Giant Video Display Pads . . . . . 5 Pads $37.50

House brand 5¼ Diskettes . . . . . 10 for $40.00

Blank Computer Cassettes . . . . . 5 for $9.00
10 for $16.00

Data Separators (not one shot) $46.00

Fine line graphics & lower case modification kit $150.00

16K memory, 250ns $59.95

Installation of above $20.00

Installation of speed up mod $45.00

Level 2 Roms $175.00

Installation. $25.00

Lower case mod (electric pencil type) Send keyboard via comet etc. We install $45.00

OTHER PROGRAMS

Terminal features multi-protocol capability - auto repeat keys - true break key - soft keys, user programmable - forward or reverse scrolling - receive to disk file, printer or buffer. $88.00

The Electric Paintbrush — A graphics language, very powerful. $21.00

Stimulating Simulations — from Personal Software. . . . $21.00

General Mathematics $12.50

CCA DMS — Data Base rep. 32K . . . . . Disk $95.00

MU MATH from MICROSOFT — a fantastic mathematic program . . . . . Disk $77.00

Azimuth Finder — Amateur Radio gives beam heading, call signs & distance for 100's of countries screen or printer $14.00

Ham Package — Instant Software $10.00

Music Tutor (write music on your TRS-80) $12.00

Opera by Acorn — got to be heard to be believed. . . . $16.00

Engineers — Beam Analysis Program $25.00

Common basic programs (matches Osborne book) . . . $17.50

Adventure 9 (Ghost Town) $16.00

AUSTRALIAN PRODUCTS

green screen

- Give your monitor the luminous green character found on the very expensive computer.
- Add professional look to your system & programmes.
- The screen may be easily removed; no modification to monitor.
- This product is not an inferior thin product, but 1/8" thick quality material. For business applications, reduced eye strain which improves operator efficiency. For the hobbyist, brighter and bolder graphics.

Screen for Model 1*	$19.95
Model 2	$24.95
Dick Smith Monitor	$21.00

**Specify if current model VDU.*

Diskmaster organises your disks. This program automatically reads disk directory and even renames disk if you wish and gives either a screen or printer output if your software. Even shows free granules & what systems on each disk. Only required one drive. $24.95

Azimuth Finder — Amateur radio gives beam heading, call signs and distance for 100's of countries screen or printer. $14.00

**Dealer enquiries welcome on these products.*

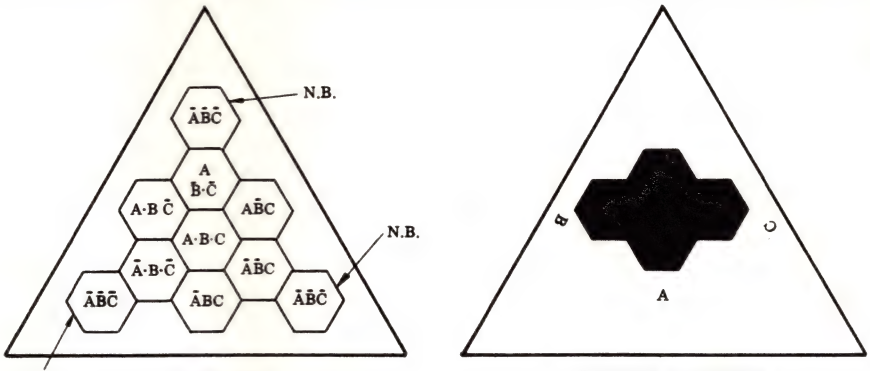
1). The clue here is to remember that 'If A then B' has got nothing to say about conditions in C or about the area outside the three hoops. The only conditions NOT allowed are A alone, or A only with C.

The reader is now equipped to study Figure 1 very carefully and should not proceed until it has been fully understood.

Window cards

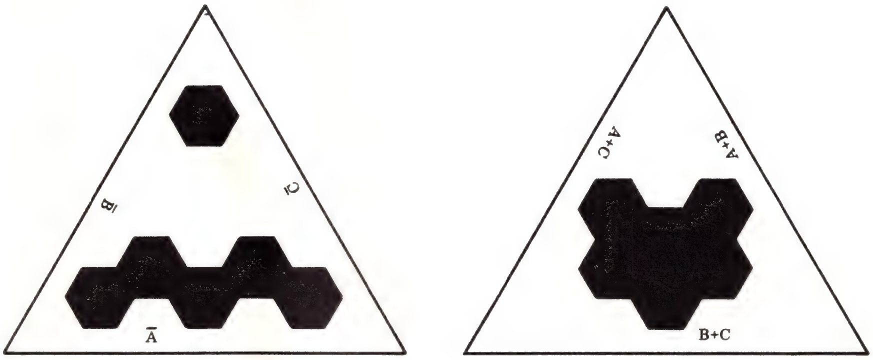
A window card system for Venn Diagrams was devised by Martin Gardner of the *Scientific American* and modified by Cundy & Rollett for their very fine book, *Mathematical Models* (Clarendon Press, 1960). It's based on the notion that if windows are cut in cards corresponding to different Boolean statements, then holding the cards in superimposition will reveal the logical elements that are true in all the applied statements.

The reader is referred to the work by Cundy & Rollett for a detailed description of a beautifully-devised system of cards of an equilateral shape, the idea being that each card may be made to do treble duty as it's turned around. (Fig 2). This of course cuts down the work of preparation if they are to be used repeatedly. Such a set ought to be in the possession of every teacher expecting to devote a fair amount of time to Venn diagrams and Boolean algebra. Ideally, the sets should be cut out of hardboard or thin ply . . . if varnished, such a set will



BASE CARD

POSITIVE ATTRIBUTE



NEGATIVE ATTRIBUTE (NOT)

INCLUSIVE OR

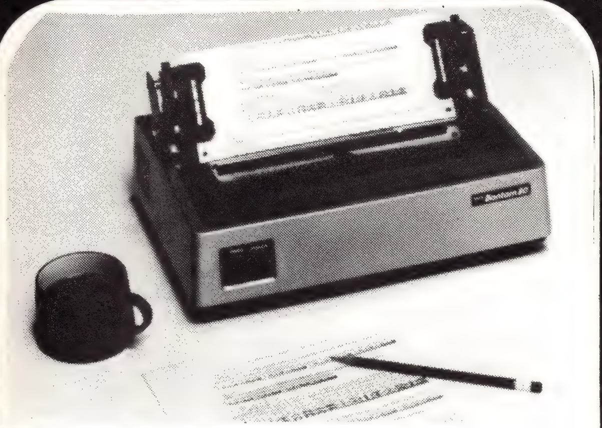
Fig 2 Note that the area outside the hoops has been reduced to three hexagons

ADE

THE PROFESSIONAL'S CHOICE

COMPUCOLOR II

MICROLINE 80



SPECIFICATIONS
- Integral Mini Disk Drive Standard
- Color Graphics on 128 x 128 grid
- Extended Disk Basic
- Eight colours (foreground and background)
- Up to 32 K/B user memory
- 8080 assembler available

APPLICATIONS
Education: Programmed learning
Small accounting or business systems
Process or control functions
A multitude of games available.

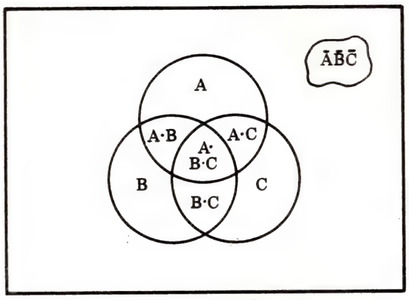
SPECIFICATIONS
- 80 cps 9 x 7 dot matrix
- Program selectable fonts
- Graphics
- 80-132 column printing
- 200,000,000 ch. head life
- full 96 ch ASC II Set

DEALER
ENQUIRIES
WELCOME

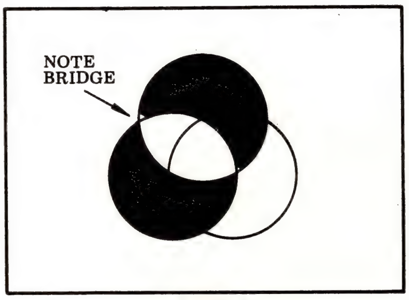
ANDERSON DIGITAL EQUIPMENT PTY. LTD.

THE VIABLE ALTERNATIVE

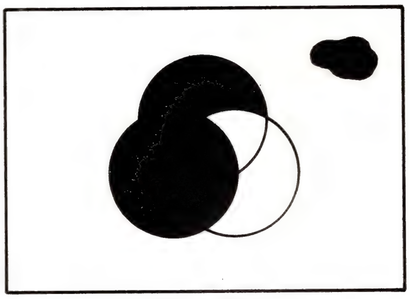
P.O. Box 322, MT WAVERLEY, VIC. AUST. 3149 Phone (03) 543 2077, P.O. Box 341, Thornleigh, N.S.W. AUST. 2120
Phone (02) 848 8533. Adelaide: 79 9211. Perth: 325 5722. Hobart: 34 4522. Brisbane: 350 2611. Darwin: 81 5760.
Canberra: 58 1811. Newcastle: 69 1625. Albury/Wodonga: (062) 2761. Barnawartha 129. N.Z. Wellington: 693 007.
Auckland: 87 6570. Christchurch: 79 6210. New Guinea Lae: 42 3924.



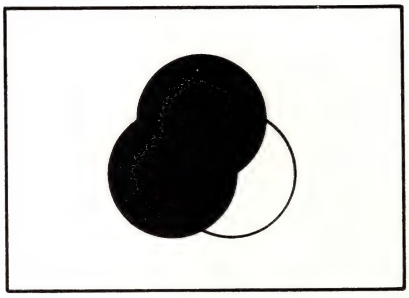
BASE CARD



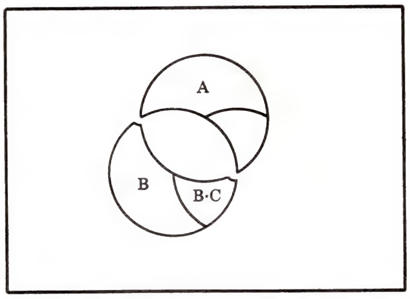
A EX-OR B



IF C THEN B



A+B



CARDS ASSEMBLED

Fig 3 Black areas are to be cut out

give many years' wear. Middle or secondary pupils may gain much from making their own sets of cards, but generally speaking younger children do not have the necessary skills to ensure the accuracy needed for a triangular set.

The simpler type, suited for student construction, should be square — a shape swiftly and accurately cut on a guillotine. A template of hardboard is needed for every ten or twelve pupils, of standard dimensions and with a triangle taped or painted on it — indicating the position of three holes. To use the template, the pupil simply places it over his card and pricks through the three holes, giving him the three centres around which he may inscribe circles of a standard radius — say 1½ inches.

A base card is prepared first as in Figure 3. This is common to all problems. Note that for convenience, the entire area outside the three circles is reduced to an irregular shape at top right. This is a universally adopted and useful convention which removes the obvious difficulty entailed when this area is to be revealed by a window.

A thin overlay card is now required for each Boolean statement, based on Figure 1, where the window is to be the shaded part. It avoids waste if the pupil lightly hatches the area to be cut away and has the teacher check it before cutting is done. The Boolean statement should be written on the face of the card. Note that sometimes little bridges of card should be left to hold inner parts in place.

When all cards representing statements have been cut, they are superimposed over the base card; the Boolean statement common to all (and hence true), is read off the base card through the windows.

The following two examples will suffice to show the type of problem suitable for window cards.

Example 1

In a certain school where children study French, German and Latin, the following restrictions are imposed. French and German may not be studied together. If Latin is taken, then German must also be studied. At least French or German must be taken. What therefore are the possibilities for study?

We label French as A, German as B and Latin as C. It's then clear that the three Boolean statements are A ex-or B, if C then B, A + B. From these we can produce the three window cards of Figure 3 and if they are superimposed over the base card, we can read that the possibilities are A (French alone), B, (German alone), or B.C (German and Latin together).

Of course, most people could have solved the problem in their heads, but we are here concerned (i) with proof that the system really does work, and (ii) with a model of how a logical machine would do the job.

Example 2

Mack, Jack, Bill and Tom are four hermits living on a remote Scottish mountain. One day Tom is found with a knife in his back, very dead. Mack, Jack and Bill trudge many weary miles to report the incident to the police and Inspector McPlod takes a statement from each of them.

Mack said, "Ah dinna ken onything aboot it."

Jack, "Bill told me that he saw Mack do it."

Bill said, "I think Mack and Jack did it together."

If we make two assumptions, (1) that only the guilty lie and (ii) that Tom was not murdered by anyone outside of these three, what are the possibilities? Using his window cards, Inspector McPlod knew whom to arrest for murder. Do you? (The answer is in the Appendix.)

Computer operation

It should by now be clear that Boolean algebra is easily handled by computers because a binary bit can represent one statement — 1 for yes or true; 0 for no or untrue. The reader should be able to see that combinations of binary coded words may represent the most complex Boolean statements and the computer can readily compare binary words in a manner analagous to the window cards — and so determine the truth or falsity of a large number of statements.

Just as the lie detector is not magic but gains results in the hands of a skilled operator from the measurement of skin reaction, heart beat and respiration of the person under test, so neither is the computer magic for it depends upon the rigorous application of commonsense rules. What gives the computer its magic-seeming ability in the eyes of many people is that, being a machine, it can handle thousands of statements at lightning-fast speed.

So far we have looked briefly (and superficially) at how the computer can handle Boolean statements. Readers who are especially interested in Boolean algebra will find many books in any library or bookshop that cover the subject far more comprehensively than there is time to do here. In a later chapter we shall see how Boolean algebra can describe computer operation.

Appendix

The solution to Example 2 is as follows:

Let A=Mack did it; B=Jack did it; C=Bill did it. Now Mack's assertion that he knows nothing about the crime implies that Jack and/or Bill did it. This can be reduced to B + C (remembering that + indicates the inclusive-or). Jack's statement is interesting. If Bill was telling the truth (when he told Jack that Mack did it), then A is true. If not, than he (Bill) was the guilty party and C is true. Jack's statement therefore can be reduced to A ex-or C. Of course, Bill's statement reduces to $A.B.\bar{C}$ (A and B, not C).

We now have three logical statements to consider: B + C; A ex-or C; $A.B.\bar{C}$. If we assemble three overlay cards representing the truth of these statements, no part of the base card shows through . . . nobody killed Tom. Since this is patently untrue, one or more of the statements must also be untrue. Therefore we assemble the three overlay cards in all possible permutations of two, omitting one in turn. If we omit the first card, nothing shows through — therefore Mack's statement must be untrue. That is to say, if he really knew nothing about it, then nobody killed Tom!

Checking further, we find that the same remarks hold true of Jack's statement, while if we omit the last card (that is, check to see if it was a lie), we find that the only possibility remaining is A alone — that Mack did it unaided. This is self-contradictory. If Bill is lying (making him guilty), the only logical conclusion is that Mack did it! Therefore the ONLY TRUE STATEMENT is Bill's; Mack and Jack committed the murder together.

PAST MOVES

By Kevin J. O'Connell

A brief run through the history of programming computers to play chess.

1937-1945 Konrad Zuse, who was probably the first ever chess programmer, started, and did not fall far short of completing, a chess program. See K. Zuse, Der Computer – mein Lebenswerk, verlag Moderne Industrie, 1970.

1948-1950 Claude Shannon wrote, presented and published his famous paper: Programming a Computer for Playing Chess. Zuse may have been first but it's Shannon's paper (and its subsequent influence) that marks him out as the father of computer chess.

1951 The first game 'played by computer'. Alan Turning wrote two programs, but did not complete them sufficiently to be able to run them on Manchester University's Ferranti Mark 1. However, two games at least have been preserved which were played by laborious hand simulation.

1956-1957 A program to play a reduced version of chess, excluding the bishops, on a 6x6 board was developed at the Los Alamos Scientific Laboratory in New Mexico. Running on the quaintly named Maniac computer, the program performed an exhaustive 4-ply search in an average of 12 minutes or so. For real chess, about three hours per move would have been required.

1958 The first program to play proper chess. This was developed at the Massachusetts Institute of Technology by Alex Bernstein and others. Running on an IBM 704, which could perform some 1 billion calculations per day, it took about eight minutes to produce a move. The program searched to a depth of 4-ply, examining only the best seven moves in any position, these moves themselves being selected by up to eight decision routines.

1959 Alan Newell, John Shaw and Herbert Simon, working at what is now Carnegie-Mellon University in Pittsburgh, published 'Chess Playing Programs and the Problem of Compexity'. The significance of their work was the development of the alpha-beta algorithm for tree searching. Rated as one of the greatest advances in the field of computer chess, this algorithm is now very well-known. If you need more information on it, then consult p.21 of the July 1980 issue of APC.

1961 The first well publicised program written in the Soviet Union made its debut, a description of the work being published in one of the bulletins of the World Championship Match between Tal and Botvinnik. This year is more significant for the involvement of two World Chess Champions. Dr Mikhail Botvinnik began to write on the subject of computer chess and started work on an algorithm. Dr Max Euwe became involved in a EURATOM research project in Italy. Thus the gap between the worlds of chess and computers began to be spanned, with many benefits subsequently accruing to both sides.

1961-1962 Alan Kotok wrote, under the guidance of John McCarthy, a chess program for his bachelor's thesis at MIT. The program performed a variable depth search.

1966 Kotok's program, further developed by McCarthy, played a four game match against a program developed at the Institute of Theoretical and Experimental Physics in Moscow. An outstanding success for the Soviet program, which won two and drew two games, the event was more significant for the publicity and attention it drew to the field; it paved the way for a proliferation of computer chess tournaments.

1966 Starting at the end of the year a program was developed on a PDP-6 at the Artificial Intelligence Laboratory of MIT. The program was written primarily by Richard Greenblatt. The program, named MacHack VI, was made an honorary member of the US Chess Federation.

1968 The famous Levy bet was born at a Machine Intelligence Workshop in Edinburgh. The bet was that no program would be able to beat Levy in a match by the end of August 1978.

1970 The first chess tournament for computer programs. This was held as part of the annual conference of the Association for Computer Machinery; it later developed into the annual US Computer Chess Championship.

1974 The first World Computer Chess Championship was held in Stockholm. It was won by KAISSA (USSR) with CHESS 4.0 (USA) in second place.

1975 The start of personal computing. Also oft-voiced idea began to take shape at MIT with the construction of a machine devoted to computer chess.

1977 The first commercial chess computer appeared on the market: Chess Challenger from Fidelity Electronics. A stone-age machine by today's standards, it was not able to play legal chess.

1977 The 2nd World Computer Chess Championship in Toronto was won by CHESS 4.6 ahead of KAISSA.

1977 CHESS 4.6 challenged Levy to a 2-game match which was played on April Fools' Day in Pittsburgh. Levy won the first game.

1977 The first game ever won by a computer program against a Grandmaster opponent – CHESS 4.6 beat Michael Stean, Britain's number 2.

1978 The final challenge under Levy's bet was made by CHESS 4.7 and a 5-game match was played in Toronto which Levy won by 3½-1½, thus concluding the bet except for one minor detail – Mr Kozdrowicki has a 'debt of honour' to pay.

1978 The first Personal Computer World micro chess tournament was held in London.

1980 Anatoly Karpov, the World Chess Champion, gives a simultaneous display against 25 chess computers in Bad Kissingen, West Germany. One of his opponents, the Chess Champion Super System III, obtained a winning position against him, although it subsequently lost.

1980 The first World Micro Chess Championship was held in London as part of this year's Personal Computer World show. It will be followed, in a couple of weeks, by the 3rd World Computer Chess Championship in Linz, Austria.

TYPICAL PSU DESIGN

By Derek Chown

As soon as I began contemplating the purchase of a microcomputer I became aware of necessary care in the choice of a power supply. I had never previously seen the need for so many amps at so few volts, and on talking to people who have themselves built power supplies for microcomputers I found there were more potential problems than I had realised. However, in consultation with these people, I have come up with this design which has so far given me no problems at all.

What Are The Problems?

1. Power supplies delivering a high current get hot and therefore need heat-sinks.
2. Computers are typically very expensive compared with power supplies, and this has to be taken into account at the design stage.
3. Mains electricity is not as nicely behaved as we might wish, particularly in the neighbourhood of fluorescent lights. Electrolytic capacitors are not very good at smoothing out bursts of very high voltage and short duration (usually referred to as "spikes").

The Circuit

There is nothing unusual in this circuit. It's built around the Darlington pair TR1 and TR2, which are working well within their limits provided adequate heat-sinking is used (e.g. Radio Spares type 401-807).

Any variation in output voltage is sensed by the 741C, which is operating as a differential amplifier, and fed back to the base of TR1. Thus VR1 is used to adjust the output voltage to 5 volts, by changing the voltage on the inverting input of the 741C.

Current limiting is provided by TR3 which prevents the voltage across R5 rising above approximately 0.6 volts. If 0.6 volts is reached, TR3 switches on causing the base of TR1 to go more positive and reducing the current through TR1 and TR2. C2 is intended to prevent very rapid switching of TR3. The value chosen for R5 depends on the maximum current required, Imax. R5=0.6/Imax Ω. The power rating of R5 is ⩾ 0.6 x Imax Watts.

Protection For The Microcomputer

Some degree of protection is provided by the current limiting, but obviously this is not sufficient. We really want to be able to switch off completely at the first sign of danger, even though this means the loss of any information stored in RAM. (It hasn't happened to me yet!)

If the voltage across the base and emitter of TR4 exceeds 0.6 volts the transistor conducts, causing the SCR to "fire". This short-circuits the supply and blows the fuse with the aid of the stored charge in capacitor C1. Note that the short-circuit current is not passed through the stabilisation network. This would probably not be harmful provided the SCR is on a heat-sink and thick wires are used. I have experimented with short-circuiting the supply without doing any damage, but even so, my preference is to blow the fuse and have done with it. This device has the nickname "crow-bar" protection.

Spikes

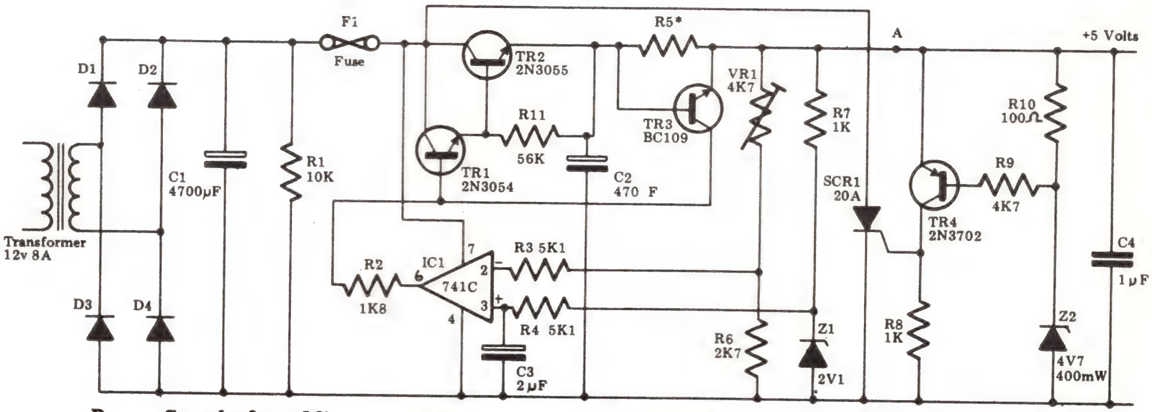
Finally there is the problem of fluorescent lights being switched-on sending high voltage spikes through the mains. I am told that these spikes glide through transformers like ghosts through walls, and pass over electrolytic capacitors without noticing them. This is the reason for C4 which is a polyester or polycarbonate capacitor and can therefore smooth out very rapid spikes.

Conclusion

This is a simple stabilised power supply using entirely standard techniques; yet it fulfils the requirements of a microcomputer, being reliable against failure, and safe against too high voltage and spikes. I have tested it for hours at 6 amps satisfactorily, and for several weeks continuously at 3½ amps without problems. I see no reason why it shouldn't work at even higher currents, as the 3055 transistor can run at 15 amps and 115 watts. With a 12 volt transformer and proper heat-sink and wiring the circuit should be able to provide currents in excess of 10 amps.

The price of components etc is quite low compared with other power supplies, being only $24 plus transformer plus case. This includes a heat-sink, and a few other bits and pieces.

Construction is straight-forward. I have made a printed circuit board, but other constructors will adopt their preferred techniques. Just one word of warning, though, you should be prepared to blow an awful lot of fuses before you connect up the power supply to any expensive equipment.



Power Supply for a Microcomputer

*R5 = 0.6/Imax Ω
Rating, 0.6X Imax Watts, or more

POWER SUPPLIES EXPLAINED

C.E.Collingham writes for the amateur who, with little knowledge of electronics, has built a piece of equipment and now needs a suitable power supply. Very often the PSU is lashed together as an afterthought. However if not properly designed, it can prevent a completed project from performing as it should.

In any power supply unit, the transformer is the device which enables an alternating voltage to be changed in level, either stepped up or down; this is the main reason for using A.C. for power distribution.

A simple transformer may be constructed by winding two coils on an iron core. An alternating supply is connected to the primary and this produces an alternating magnetic flux, which is linked, via the core, to the secondary winding.

The voltage per turn induced in the secondary is very nearly the same as the voltage per turn of the primary. This means that if the primary has 10 times the number of turns, for 240V in, our transformer will produce 24V across the secondary.

As the losses are low, the output power is very nearly equal to input power; thus if the voltage has been reduced, the available output current has been proportionally increased. The rating of a transformer is given in volt amperes. . . the product of the secondary A.C. voltage and the secondary A.C. current. Providing the transformer is supplying a resistive load, then VA=Watts. Values of alternating current or voltage usually refer to its R.M.S. (root mean square) value. This is most simply stated as being the direct current or voltage which would produce the same heating effect.

For a sine wave, the peak value is 1.4 times its R.M.S.; the peak value of the 240V mains is therefore 336V.

Having produced an isolated low voltage supply which will deliver the necessary current, the next stage is to convert it to direct current. This is achieved by rectification — usually by the use of silicon diodes. A diode is simply a semiconductor device which will allow current to flow in one direction only.

By simply placing a diode in series with the secondary, the waveform shown in Fig. 1 is produced; this is known as raw D.C. Although the current now only flows in one direction, it's not there all the time. A reservoir capacitor is therefore connected across the output (as shown) and when the top terminal of the transformer is more positive than the top of the capacitor, current will flow through the diode in the direction of its arrow — to charge the capacitor, as well as supplying current to the load. When the transformer voltage drops, the diode is "reverse biased" and the capacitor supplies current in to the load. Because the negative half cycle of the transformer's output is not used, the half wave rectifier (as it's known) is inefficient and rarely used for high power supplies.

WARNING

When working on power units, always remember that on one side of the transformer is mains voltage . . . treat it with respect. Always use sleeving on any tags carrying mains, and when completed, enclose the unit in a case. The only other strong recommendation is that you check the output voltage BEFORE you connect it to your circuit.

Fig. 1

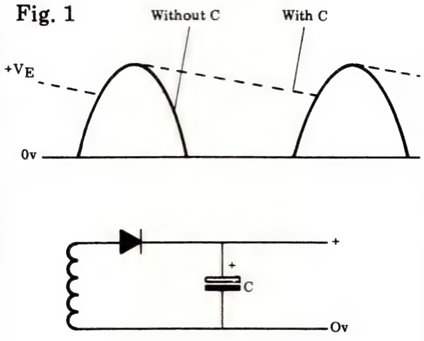
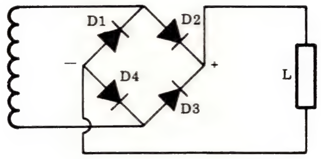


Fig. 2



If another similar secondary winding is added in series with the first, then with reference to their junction (or centre tap), for every output peak, one end will be positive. If a diode is connected from each end to the capacitor, it will be recharged twice as often, which means that the "ripple", or the amount the output voltage drops between charges, is reduced. This arrangement produces full wave rectification.

It should be noted that the capacitor will be charged to the peak voltage appearing across each winding, which for a 12 — 0 — 12 transformer will be over 16V. The voltage rating of the capacitor should therefore be at least 20V. During the time that the diode is turned off, the transformer output goes more negative than O V and this voltage appears in series with the capacitor voltage across the diode. A diode will only stand a certain reverse voltage (P.I.V.) — without breaking down. A device with a P.I.V. of at least 2.8 times the R.M.S. voltage is therefore required.

It's possible to produce full wave rectification from one winding by using four diodes in a bridge arrangement. Bridge rectifiers are available and they consist of four diodes connected together and encapsulated in epoxy, which can be bolted directly on to a heatsink.

The circuit is shown in Fig 2. At any one time only two diodes are conducting. If the top of the transformer is more positive than the bottom, current flows through D2, the load, and then D4 back to the transformer. If the bottom is more positive then current flows through D3, the load, then D1, current always passing through the load from top to bottom on every half cycle of the A.C. voltage.

When in its forward biased (or conducting) state, a silicon diode will drop about 0.7V, which may need to be allowed for in low voltage supplies.

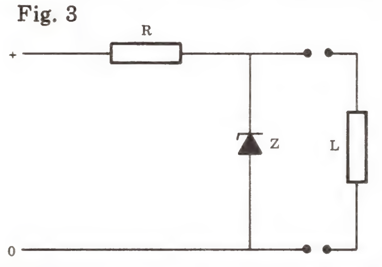
Another figure to take into account is the regulation of the transformer. This is the fluctuation in output voltage with varying load current. For small transformers it can be as high as 30% and since the secondary voltage is specified at full load current, with no load connected, the output voltage can be very much higher than expected. It's therefore wise to be very generous with capacitor voltage ratings . . . they cause quite a mess when they explode!

This varying output voltage is of no use to most electronic equipment; a typical microprocessor for instance requires 5V ± 0.2V. Since the current taken by a microprocessor can vary considerably — particularly if L.E.D. displays are used — some form of voltage regulator must be included.

At the heart of most voltage

regulators is the zener diode. This behaves as a normal silicon diode when forward biased, but when the voltage is reversed, it blocks current flow only until a certain voltage is reached, at which point the diode breaks down and current increases rapidly. Zener diodes are available in a wide range of voltages, from 2.7V to over 70V, and at power ratings from 400mW up to several Watts.

Fig. 3



A zener diode and resistor can form a simple stabilizer, as shown in Fig. 3. If the input voltage increases, the zener draws more current, and a greater voltage is dropped across the series resistor. If the load current increases, the zener current reduces by the same amount. The voltage across the zener therefore remains constant. If the load is disconnected, the power it was consuming must be dissipated by the zener. This, coupled with the fact that the series resistor is wasteful of power, makes such a circuit suitable only for low power requirements.

For higher current supplies, the zener is used to stabilize the base voltage of a series pass transistor, the emitter voltage remaining 0.7V lower (for a silicon transistor). The base current required by the transistor will vary depending on the load current, but by a relatively small amount. The base feed resistor should be chosen to provide sufficient current to the transistor and at least 10mA through the zener.

The circuit shown in Fig 4 will provide a 5V supply from a 10V input. If the transistor has a gain of 50, then to supply 1A, the base current needs to be 20mA. A 5.6V zener is required and the resistor value is given by:

$$\frac{V}{I} = \frac{10 - 5.6}{0.03} = 146 \text{ Ohms}$$

and it needs to dissipate:

$$V \text{x} I \text{ Watts} = 4.4 \text{ x } 0.03 = 0.13\text{W}$$

A 150 Ohm 0.25W is the nearest preferred value.

Any NPN power transistor capable of passing the required current is suitable and should be mounted on a heatsink, as it has to dissipate 5W.

The disadvantage of this circuit is that if the output terminals are accidentally shorted together, the current will only be limited by the transformer, and a very high peak current will flow as the reservoir capacitor discharges. The whole of this power will be dissipated in the transistor — leading almost certainly to its rapid death. This could mean that when the short is removed, if the transistor has also gone short circuit, the full unregulated supply will appear at the output, resulting in the destruction of even more components.

A fuse may provide some protection, but in electronic terms, they can take considerable time to operate, and the damage may well have been done. A more sophisticated voltage regulator, which includes a current limit circuit, is shown in block form in Fig 5. This has a series resistor in the output lead. The voltage across this resistor is measured and if it exceeds a certain value, the output voltage is reduced and the power unit becomes a constant current supply. Also, because of the voltage drop across the resistor, the voltage at the output terminals is fed back to the regulator circuit to ensure that it remains constant with varying loads.

Needless to say, all of this circuitry and a bit more besides is available in I.C. form. The voltage regulator I.C. can be either the type which drives a series transistor, or one which may be used alone. These "three terminal" regulators are available in an ever increasing number of types, from 100mA to 5A, positive or negative, and with output voltages from 5V to 24V.

A popular type is the 7805. This will accept input voltages of between 7V and 25V and will deliver 5V at up to 1A. The regulator should be bolted on to a heatsink and the power supply case should be suitable; remember that the regulator's common terminal is connected to its case. To reduce the heat dissipated by the regulator, the input voltage should be about 8V. In the event of the regulator getting too hot, it will reduce its output voltage. The pin connections and recommended circuit are shown in Fig. 6; note, the decoupling capacitors should be wired as close as possible to the regulator, otherwise high frequency (about 50MHz) oscillation may occur. This circuit applies to any of the 78 series, the last two digits specifying the output voltage; the input voltage should always be at least 2.5V above the output.

Fig. 4

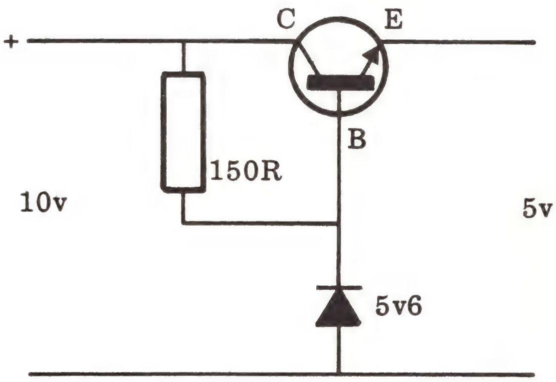
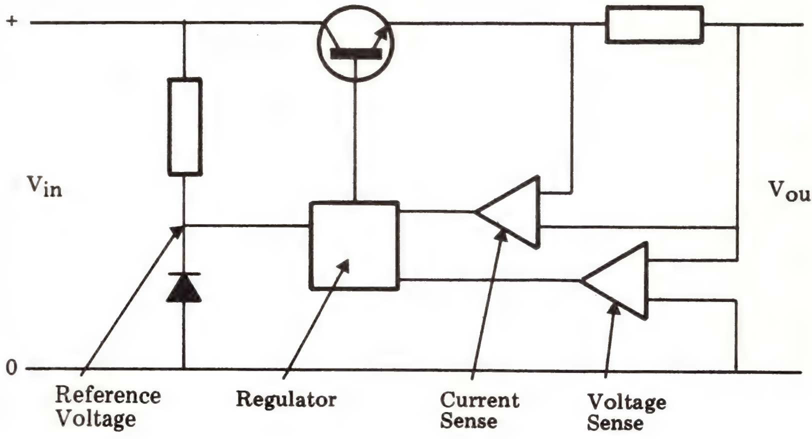
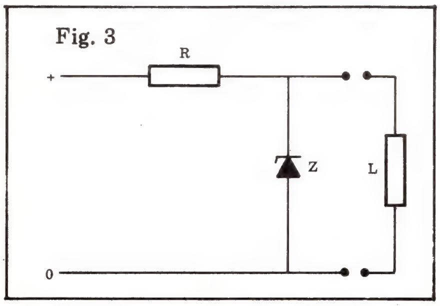


Fig. 5



regulators is the zener diode. This behaves as a normal silicon diode when forward biased, but when the voltage is reversed, it blocks current flow only until a certain voltage is reached, at which point the diode breaks down and current increases rapidly. Zener diodes are available in a wide range of voltages, from 2.7V to over 70V, and at power ratings from 400mW up to several Watts.

Fig. 3



A zener diode and resistor can form a simple stabilizer, as shown in Fig. 3. If the input voltage increases, the zener draws more current, and a greater voltage is dropped across the series resistor. If the load current increases, the zener current reduces by the same amount. The voltage across the zener therefore remains constant. If the load is disconnected, the power it was consuming must be dissipated by the zener. This, coupled with the fact that the series resistor is wasteful of power, makes such a circuit suitable only for low power requirements.

For higher current supplies, the zener is used to stabilize the base voltage of a series pass transistor, the emitter voltage remaining 0.7V lower (for a silicon transistor). The base current required by the transistor will vary depending on the load current, but by a relatively small amount. The base feed resistor should be chosen to provide sufficient current to the transistor and at least 10mA through the zener.

The circuit shown in Fig 4 will provide a 5V supply from a 10V input. If the transistor has a gain of 50, then to supply 1A, the base current needs to be 20mA. A 5.6V zener is required and the resistor value is given by:

$$\frac{V}{I} = \frac{10 - 5.6}{0.03} = 146 \text{ Ohms}$$

and it needs to dissipate:

VxI Watts = 4.4 x 0.03 = 0.13W

A 150 Ohm 0.25W is the nearest preferred value.

Any NPN power transistor capable of passing the required current is suitable and should be mounted on a heatsink, as it has to dissipate 5W.

The disadvantage of this circuit is that if the output terminals are accidentally shorted together, the current will only be limited by the transformer, and a very high peak current will flow as the reservoir capacitor discharges. The whole of this power will be dissipated in the transistor — leading almost certainly to its rapid death. This could mean that when the short is removed, if the transistor has also gone short circuit, the full unregulated supply will appear at the output, resulting in the destruction of even more components.

A fuse may provide some protection, but in electronic terms, they can take considerable time to operate, and the damage may well have been done. A more sophisticated voltage regulator, which includes a current limit circuit, is shown in block form in Fig 5. This has a series resistor in the output lead. The voltage across this resistor is measured and if it exceeds a certain value, the output voltage is reduced and the power unit becomes a constant current supply. Also, because of the voltage drop across the resistor, the voltage at the output terminals is fed back to the regulator circuit to ensure that it remains constant with varying loads.

Needless to say, all of this circuitry and a bit more besides is available in I.C. form. The voltage regulator I.C. can be either the type which drives a series transistor, or one which may be used alone. These "three terminal" regulators are available in an ever increasing number of types, from 100mA to 5A, positive or negative, and with output voltages from 5V to 24V.

A popular type is the 7805. This will accept input voltages of between 7V and 25V and will deliver 5V at up to 1A. The regulator should be bolted on to a heatsink and the power supply case should be suitable; remember that the regulator's common terminal is connected to its case. To reduce the heat dissipated by the regulator, the input voltage should be about 8V. In the event of the regulator getting too hot, it will reduce its output voltage. The pin connections and recommended circuit are shown in Fig. 6; note, the decoupling capacitors should be wired as close as possible to the regulator, otherwise high frequency (about 50MHz) oscillation may occur. This circuit applies to any of the 78 series, the last two digits specifying the output voltage; the input voltage should always be at least 2.5V above the output.

Fig. 4

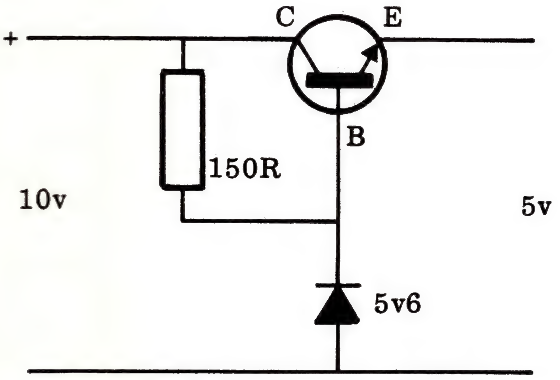
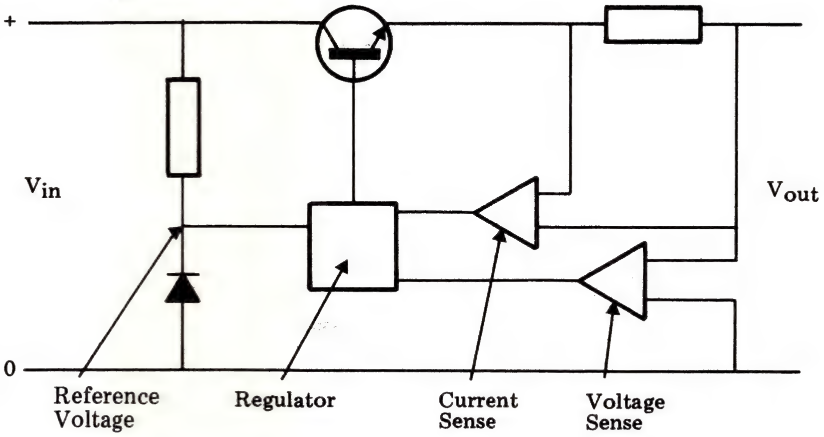


Fig. 5



C.I.S.A.
159 KENT STREET, SYDNEY

The One-stop Microcomputer Shop Providing a Total Service to TRS-80* and System 80 Users.

(TRS-80 is a registered Trademark of Tandy Radio-Shack)

HARDWARE AND MODIFICATIONS

Having system crashes? Plug in our line filter and get main-frame stability	$ 55.00
Use your TRS-80 as a telephone book and automatic dialler. No hardware mods required. All software included	$ 59.50
LIGHT PEN with demonstration software and full programming instructions.STILL ONLY	$ 19.50
Lower case mod for ELECTRIC PENCIL and SCRIPSIT. Fitted and 90 day guarantee	$ 49.95
VIDEO STABILIZER CRYSTAL. Get professional stability on your VDU. CRYSTAL only	$ 19.95
Fitted and guaranteed	$ 39.00
16K MEMORY KITS	$ 85.00
We install.	$105.00
RS-232 PRINTER DRIVER. Operates from cassette cable. Including software.	$ 54.75
CISA DATA DIGITIZER. Our most popular hardware product. No hardware mods required. Reads and re-records tapes normally unreadable by any other method	$ 57.50
CASSETTE CABINET. Protect your valuable cassettes in this strong, handsome 36 cassette cabinet	$ 27.75

DIGITAL CASSETTES – Top quality

C15's	1 – $1.65	10 –$14.85
C20's	1 – $1.85	10 – $16.85
C30's	1 – $1.99	10 – $18.50

This is an entirely new product. We are so confident of this product that we are now recording all our commercial software on it.

5¼" PRIME QUALITY DISKETTES

1 – $4.95	10 – $45.00

All tracks guaranteed to load

We are extending our range of computer paper and labels for the enthusiast and the business user.

LATE SPECIAL!

EXATRON STRINGY FLOPPIES	P.O.A.
77 Track Micropolis Drives complete with DOS.	P.O.A.

BOOKS

We believe that we have the best and most comprehensive range of titles of interest to the TRS-80 owner/user. Over 200 titles presently in stock. COME IN AND BROWSE AROUND!

JUST A SELECTION

First Book of Microcomputers	$ 6.50
Pascal with Style	$ 8.50
Basic with Style	$ 8.00
TRS-80 Disk and Other Mysteries.	$29.50
Level II ROM Reference Manual	$24.95
Basic and the Personal Computer (highly recommended)	$15.95
Basic Programming for Scientists and Engineers.	$15.50
The Incredible Secret Money Machine	$ 7.95
Z-80 Microcomputer Handbook.	$11.95
Microcomputers for Business Applications.	$11.95
Z-80 and 8080 Assembly Language Programming.	$10.00
How to Profit from your Personal Computer	$12.00
Little Book of Basic Style	$ 7.95
Microcomputer Interfacing	$25.75
Microcomputers and the 3 R's (A Guide for Teachers)	$10.00

COMPUTER CLASSICS

Wirth/Algorithms + Data Structures = Programs	$29.75
Tausworth/Standardized Development of Computer Software	
Vol. I – Methods	$29.75
Vol. II – Standards	$29.75
Klingman/Microprocessor Systems Design	$30.50
Gilmour/Business Systems Handbook	$29.75
Gane/Structured Systems Analysis	$26.50
Garrett/Analog Systems for Microprocessors	$26.50
Rhyne/Fundamentals of Digital Systems Design	$26.95

TRS-80 AND SYSTEM 80 SOFTWARE

Ecology Simulations 1 and 2 (disk and lower case) each.	$24.95
Mission Impossible and Voodoo Castle (disk)	$24.95
Adventureland and Pirate Adventure (disk)	$24.95
Investment Analysis (disk or L2 cassette)	$49.95
Sargon II (cassette)	$37.50
Strategy Games (5) (cassette)	$ 7.95
Space Games (4) (cassette)	$ 7.95
5 Adventures (cassette) each.	$14.95
Advanced Statistics (disk or cassette).	$24.95
U Boat (cassette)	$ 8.50
Basic Monitor (cassette)	$19.95
Micromazing (games cassette)	$ 7.50
RPN Calculator (cassette)	$14.95

PLUS MANY MORE

We stock and highly recommend all RACET COMPUTES professional standard system programs.

Infinite Basic	$ 49.95
Infinite Business.	$ 29.95
Remodel	$ 24.95
Remodel + Proload	$ 34.95
GSF.	$ 24.95
DOSORT (sorts disk files)	$ 34.95
COPSYS (copies system tapes)	$ 34.95

NEW DOS FROM APPARAT

35 Track	$ 99.00
40 Track	$110.00

This DOS emulates many mainframe capabilities. Has features usually restricted to much larger systems.

TARANTO and ASSOCIATES

General Ledger	$155.00
Accounts Payable	$155.00
Accounts Receivable	$155.00
Print Invoice	$ 99.00
Complete Business System	$500.00

This is professional quality software and really provides a superb business system for the TRS-80. Software maintenance is available to purchasers of the complete system at $15 per hour, to tailor the programs to your specific needs.

PLUS MANY MORE

We are the Australian agents for many first class U.S. software houses. Send for our full catalogue.

Remember, for all your TRS-80 and System 80 needs, phone, write or call

TRADE ENQUIRIES INVITED

Showroom:
Ground Floor, GIO Building, 159 Kent Street, Sydney 2000
(opposite IBM Building)
Phone: (02) 241 1813

We regularly conduct a series of evening periods of small group tuition from 7.30 p.m. onwards in BASIC with specific emphasis on commercial applications.

These sessions are conducted in a friendly and helpful atmosphere and are designed to give you a complete mastery of BASIC techniques up to and including all aspects of disc I/O and file handling.

We will teach you tricks even Tandy don't know about!

All stationery and workbooks are provided. Textbooks available at an extra charge.

Fee for 10 periods (up to 3 hours each) $150.00

Special private or group tuition on any aspect of BASIC or commercial/business applications of microcomputers available on request.

Tuition includes assignment work if required – and assessment.

A certificate of competence is awarded on successful completion of a tuition series.

REMEMBER – for all your TRS-80 needs – phone, write or call

CISA

159 KENT STREET,
SYDNEY 2000
(opposite IBM building)
Phone: (02) 241 1813

We are currently preparing a correspondence course for out-of-town TRS-80 users. Details will be available shortly.

We carry the full range of MICRO-80 newsletters and recorded software plus a range of popular microcomputing journals.

10 PART PASCAL SERIES

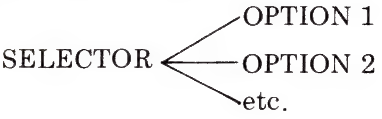
THE COMPLETE PASCAL

BY SUE EISENBACH AND CHRIS SADLER

CHAPTER 5 CONTROL STRUCTURES 2

One of the most powerful features of the computer both as an information processor and as a control machine is its ability to detect differing conditions or varying situations and to respond to these, often in a sophisticated and complex way. When analysed, this activity reduces to the capability (of the program) to pose a question, to use the available data to establish the correct answer and then to act on that answer.

This particular feature exists in most programming languages and goes under the name of a *conditional branch* or just a *conditional.* Before looking at what PASCAL provides in the way of such control structures, it is as well to define the constituent elements. The *outcome* of a conditional is always one particular course of action chosen from a set of options laid down in the program. The *function* of the conditional is to select the appropriate course depending on some circumstance. So the format is:



Clearly the options are simply sections of code which perform the different actions required. The difficult part is setting up the selection to get the right option in the first place.

Single and double branches

In the simplest kind of branch, the programmer may wish a piece of code to be executed only if some condition holds, and the program to continue once this code is completed. If the condition doesn't hold, the program continues directly anyway. In PASCAL this circumstance is handled by means of the IF — THEN statement which takes the following form:

IF expression THEN statement;

The *expression*, defined in Box 1, takes a *Boolean value* (i.e. TRUE or FALSE) which explains how it behaves as the selector. When the expression is TRUE, the statement following THEN will be executed. Otherwise program control will pass directly to the statement immediately after the ";", which is the next instruction in the program. This type of conditional can be viewed as a "single" branch because there is only one *optional* statement open to the selector.

An enhancement of this type of conditional is the "double" branch where the selector directs program control to *alternative* sections of code (depending on whether TRUE or FALSE). At the completion of either alternative, program control passes to the same point in the program — namely the statement immediately following the conditional. In PASCAL this is dealt with by means of the following:

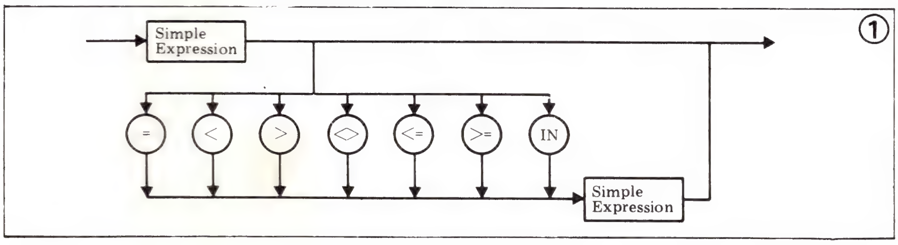
IF expression THEN statement
ELSE statement;

Note that there is no ";" between the statement governed by THEN and the reserved word ELSE. It is a frequent error amongst programmers new to PASCAL to insert a separator here, with erroneous results.

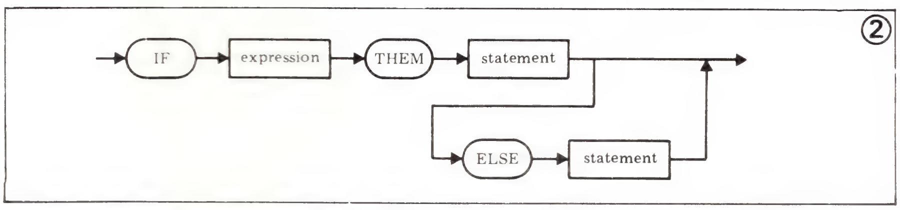
Box 2 gives the syntax diagrams for both of these variations on the IF statement, and Box 3 consists of a sample program which illustrates their use. When writing a program which is likely to be used by other people, particularly if data input is to be handled by inexperienced or unskilled operators, it is advisable to accept all input in ordinary character strings, checking on the validity and sorting out the different data types within the program. If the user makes a mistake, the program will detect it and ask for the input again, instead of crashing the processor. Considering that some such programs may run for hours (or even continuously) and may accept simultaneous input from many terminals (e.g. an airline bookings system), it is unnecessary to give further stress to the advantages of this technique.

Program READINTEGER (Box 3) is an example of the sort of routine one would use for inputting positive integers up to a fixed maximum length. The maximum number of digits allowed in any particular implementation of PASCAL will depend on the hardware being used so the program specifies INTSIZE as a CONST which can be tailored to different machines (line 2). The technique lies in reading the number in

①



②



③

```
1  PROGRAM READINTEGER;
2  CONST INTSIZE=5;
3  TYPE SHORTSTRING=ARRAY[0..9]OF CHAR;
4       DIGIT=0..9;
5  VAR TEMPNO,NUMBAS:SHORTSTRING;
6      I,J:DIGIT;
7      NEWNUM:-1..9;
8      NUMBER:INTEGER;
9      WRONG:BOOLEAN;
10 PROCEDURE INITIALISE;
11 VAR ICHR:'0'..'9';
12 BEGIN
13     ICHR:='0';
14     FOR I:=0 TO 9 DO
15     BEGIN
16         NUMBAS[I]:=ICHR;
17         IF ICHR<> '9' THEN ICHR:=SUCC(ICHR);
18     END;
19     NUMBER:=0
20 END; (*INITIALISE*)
21 PROCEDURE GETNUMBA;
22 BEGIN
23     WRITELN('NOW TYPE IN YOUR INTEGER PLEASE:  ');
24     I:=0;
25     WHILE (NOT EOLN) AND (I <= INTSIZE) DO
26     BEGIN
27         READ(TEMPNO[I]);
28         I:=I+1
29     END
30 END; (*GETNUMBA*)
31 PROCEDURE TESTDIGIT;
32 BEGIN
33     FOR J:=0 TO 9 DO
34         IF TEMPNO[I]=NUMBAS[J]
35         THEN NEWNUM:=J
36 END;
37
38 BEGIN (*MAIN PROGRAM*)
39     INITIALISE; (*SET UP NUMBAS WITH RANGE OF POSSIBLE VALUES*)
40     REPEAT
41        WRONG:=FALSE;
42        GETNUMBA; (*READ CHARACTER STRING INTO TEMPNO*)
43        I:=0;
44        WHILE (NOT EOLN) OR (I > INTSIZE) DO
45        BEGIN
46            NEWNUM:=-1; (*CHARACTER INPUT IS A PROPER DIGIT IF THIS
47                          VALUE CHANGES*)
48            TESTDIGIT; (*CHECK FOR DIGIT AND STORE IN NEWNUM*)
49            IF NEWNUM=-1
50            THEN WRONG:=TRUE
51            ELSE NUMBER:=10*NUMBER+NEWNUM;
52            I:=I+1
53        END; (*IN EACH ITERATION NUMBER IS UPDATED WITH NEXT DIGIT*)
54        IF WRONG THEN WRITELN('TRY AGAIN')
55     UNTIL NOT WRONG
56 END.
```

character form (i.e. ASCII) and translating each digit into *numeric* form. In line 16 the array NUMBAS is primed with the character codes of the different digits.

The program reads the integer into a character string in procedure GETNUMBA, lines 22-29. Note the test (line 25) checks for "EOLN" (i.e. carriage return) or for integers which exceed the maximum length. The central ploy of the program can be seen in procedure TESTDIGIT. Each element of the string is compared in turn to a succession of character codes corresponding to the different digits. If the nth comparison is successful then n is the digit sought (c.f. lines 34 and 35). The IF statement allows this to occur without any action being taken for an unsuccessful comparison. In the main body of the program, NEWNUM is used not only to hold each digit as it is "peeled" off the input string but also as the selector (line 49) in the IF statement since a value of -1 means that the last character under scrutiny wasn't a digit at all. The two courses of action (i.e. updating the number or signalling an error) are laid out in lines 50 and 51.

Multiple branching

Frequently, just having two options at some particular point in a program is not enough, since it is necessary for the program to split many ways. Perhaps the most explicit example of this requirement can be seen in the handling of a "menu" of the type found in many "business" packages. Take the example in Box 4 where the relation between the options in MENU and the procedures listed below is obvious. However, in order to get the right item in the menu, the main program has to go through the jumble of IF's from lines 22 to 32.

It is for occasions like these that the PASCAL CASE statement has been defined (most other languages have an equivalent facility). Box 5 shows the syntax diagram for the CASE statement. The format is as follows:

CASE selector OF options END;

Note that the value taken by the selector *must* be one of the items in the list of constants which label the different options. If this is not the case, the outcome is *undefined* — so it is advisable to build a test into the program to ensure that the selector is within the permissible range. Box 6 shows the way in which a CASE statement is used to tidy up SALESLEGDER (yes, SALESLEGDER, we stick by our mistakes!). Lines 20 to 25 lay out the options and SELECTION acts as the selector. However, before SELECTION is "allowed into" the CASE a check is made (lines 17 and 18) to ensure that it will make a successful selection (i.e. that it holds one of the values specified in line 3).

Finally, note the use of the statement separator ";" within the CASE statement (Boxes 5 and 6) since a semi-colon between the last option and the END which finishes the CASE statement will result in a compilation error.

④

```
 1:  PROGRAM SALESLEGDER;
 2:  VAR  SELECTION:INTEGER;
 3:  PROCEDURE MENU;
 4:  BEGIN
 5:    WRITELN('0.  FINISH');
 6:    WRITELN('1.  LIST ALL SALES');
 7:    WRITELN('2.  MONITOR SALES BY STOCK CODE');
 8:    WRITELN('3.  INVOICE SEARCH');
 9:    WRITELN('4.  AMEND LEDGER FILES');
10:    WRITELN('5.  TOTAL ALL SALES');
11:  END; (*MENU*)
12:  PROCEDURE LIST; (*LISTS ALL SALES FROM AND TO GIVEN DATES*)
13:  PROCEDURE STOCKCODE; (*DISPLAYS RECORDS USING STOCK CODE AS KEY*)
14:  PROCEDURE INVOICE; (*DISPLAYS RECORDS USING INVOICE NUMBER AS KEY*)
15:  PROCEDURE AMEND; (*FOR ALTERING FILES*)
16:  PROCEDURE TOTAL; (*TOTALS SALES ON SEVERAL KEYS*)
17:  BEGIN (*MAIN PROGRAM*)
18:    REPEAT
19:      MENU;
20:      WRITE('PLEASE TYPE IN YOUR SELECTION:');
21:      READLN(SELECTION);
22:      IF SELECTION=1
23:      THEN LIST
24:      ELSE IF SELECTION=2
25:           THEN STOCKCODE
26:           ELSE IF SELECTION=3
27:                THEN INVOICE
28:                ELSE IF SELECTION=4
29:                     THEN AMEND
30:                     ELSE IF SELECTION=5
31:                          THEN TOTAL
32:                          ELSE WRITELN('GOODBYE')
33:    UNTIL SELECTION<1 OR SELECTION>5
34:  END. (*** MESSY WASN'T IT? ***)
```

Look up table

PASCAL RESERVED WORDS
IF
THEN
ELSE
CASE
EOLN

JARGON
Conditional Branch
Selector
Case Label

UCSD Exceptions
Undefined selector values "fall through" CASE statements.

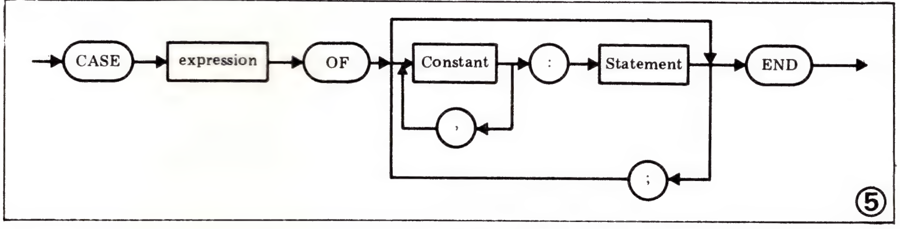
EXERCISES
1 Enhance READINTEGER to cater for negative as well as positive integers.
2 Write a program to count the occurrence of each letter of the alphabet and total of all non-alphabetic characters in a piece of text. Use a CASE statement.
3 The situation can arise in OTHELLO where it is impossible for either player to move (i.e. two consecutive PASSES). The current program does not cater for this — adapt it.

Sample program -Othello

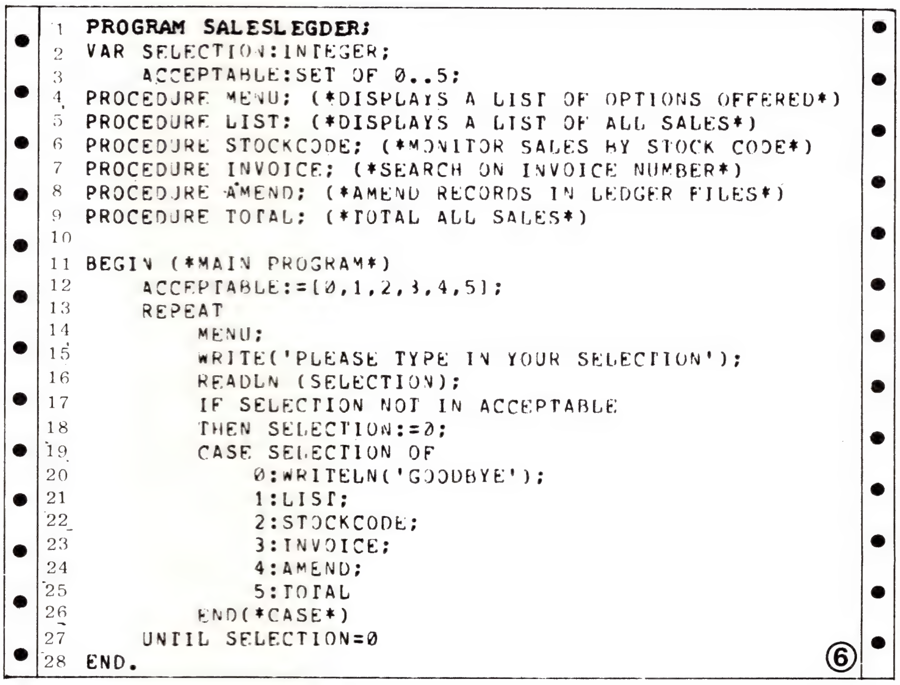
In this section we present a full program to illustrate not only the control structures of this chapter but also some of the data structures introduced in the last. Instead of describing the details of this program in the text, we shall exploit the readability of the PASCAL coding in Box 7. For instance, anyone unfamiliar with the rules of OTHELLO should consult the output text in procedure INSTRUCTIONS (line 17).

When tackling a program in this way, the approach should be to look at the data structures defined in the beginning, in conjunction with the body of the main program to try to deduce the programming strategy. Often the choice of data structures will dictate specific programming tactics within the program. A look at the TYPE statements (lines 2 to 5) will show that a board game is to be played and this is confirmed by the presence of the array BOARD with scalar indices and elements limited to FIRST, SECOND, and EMPTY.

In the main program the outer REPEAT — UNTIL loop (lines 277 to 300) allows players as many games as they like. It contains procedures to get each game started and to give the score when finished together with an inner WHILE-DO loop, (lines 279 to 297) which controls a single game.



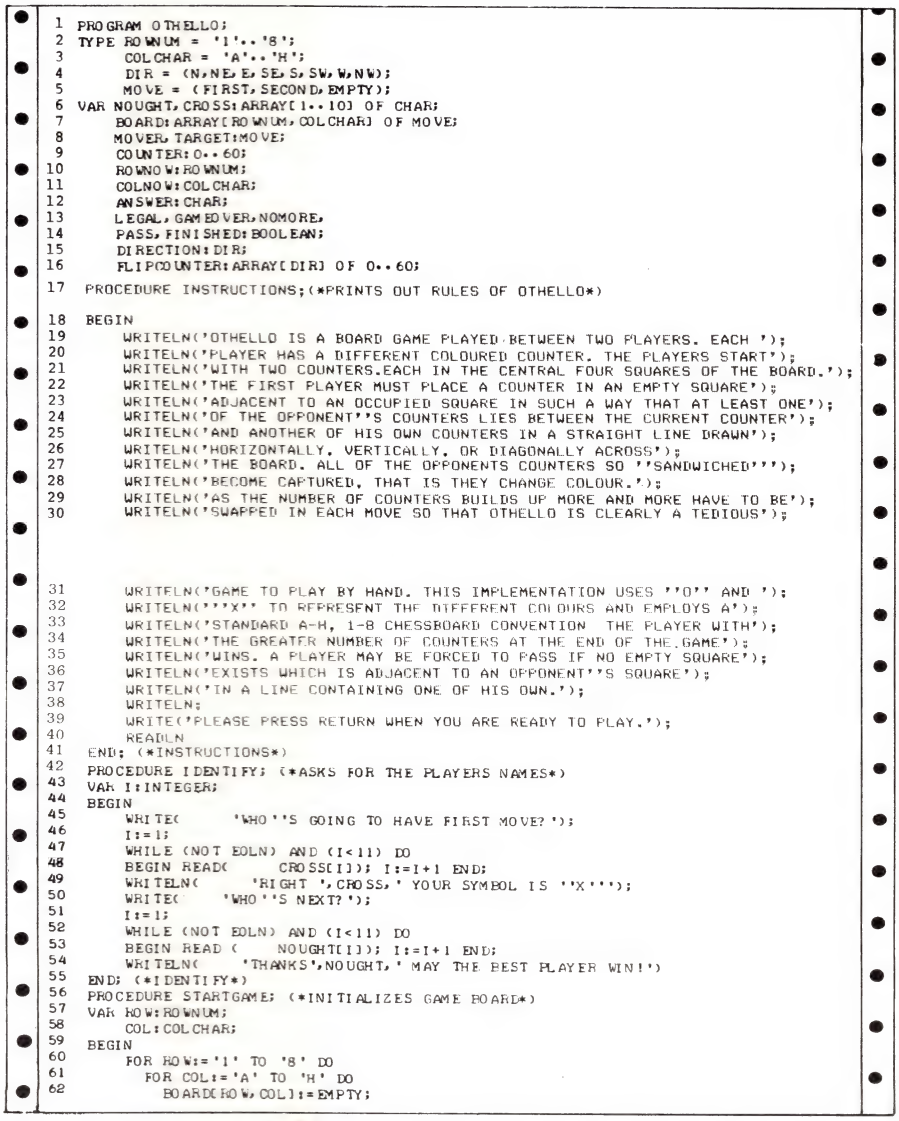
⑤



```
PROGRAM SALESLEGDER;
VAR SELECTION:INTEGER;
     ACCEPTABLE:SET OF 0..5;
PROCEDURE MENU; (*DISPLAYS A LIST OF OPTIONS OFFERED*)
PROCEDURE LIST; (*DISPLAYS A LIST OF ALL SALES*)
PROCEDURE STOCKCODE; (*MONITOR SALES BY STOCK CODE*)
PROCEDURE INVOICE; (*SEARCH ON INVOICE NUMBER*)
PROCEDURE AMEND; (*AMEND RECORDS IN LEDGER FILES*)
PROCEDURE TOTAL; (*TOTAL ALL SALES*)

BEGIN (*MAIN PROGRAM*)
     ACCEPTABLE:=[0,1,2,3,4,5];
     REPEAT
          MENU;
          WRITE('PLEASE TYPE IN YOUR SELECTION');
          READLN (SELECTION);
          IF SELECTION NOT IN ACCEPTABLE
          THEN SELECTION:=0;
          CASE SELECTION OF
               0:WRITELN('GOODBYE');
               1:LIST;
               2:STOCKCODE;
               3:INVOICE;
               4:AMEND;
               5:TOTAL
          END(*CASE*)
     UNTIL SELECTION=0
END.
```

⑥



```
 1 PROGRAM OTHELLO;
 2 TYPE ROWNUM = '1'..'8';
 3       COLCHAR = 'A'..'H';
 4       DIR = (N,NE,E,SE,S,SW,W,NW);
 5       MOVE = (FIRST,SECOND,EMPTY);
 6 VAR NOUGHT,CROSS:ARRAY[1..10] OF CHAR;
 7      BOARD:ARRAY[ROWNUM,COLCHAR] OF MOVE;
 8      MOVER,TARGET:MOVE;
 9      COUNTER:0..60;
10      ROWNOW:ROWNUM;
11      COLNOW:COLCHAR;
12      ANSWER:CHAR;
13      LEGAL,GAMEOVER,NOMORE,
14      PASS,FINISHED:BOOLEAN;
15      DIRECTION:DIR;
16      FLIPCOUNTER:ARRAY[DIR] OF 0..60;
17  PROCEDURE INSTRUCTIONS;(*PRINTS OUT RULES OF OTHELLO*)

18  BEGIN
19      WRITELN('OTHELLO IS A BOARD GAME PLAYED BETWEEN TWO PLAYERS. EACH ');
20      WRITELN('PLAYER HAS A DIFFERENT COLOURED COUNTER. THE PLAYERS START');
21      WRITELN('WITH TWO COUNTERS.EACH IN THE CENTRAL FOUR SQUARES OF THE BOARD.');
22      WRITELN('THE FIRST PLAYER MUST PLACE A COUNTER IN AN EMPTY SQUARE');
23      WRITELN('ADJACENT TO AN OCCUPIED SQUARE IN SUCH A WAY THAT AT LEAST ONE');
24      WRITELN('OF THE OPPONENT''S COUNTERS LIES BETWEEN THE CURRENT COUNTER');
25      WRITELN('AND ANOTHER OF HIS OWN COUNTERS IN A STRAIGHT LINE DRAWN');
26      WRITELN('HORIZONTALLY. VERTICALLY. OR DIAGONALLY ACROSS');
27      WRITELN('THE BOARD. ALL OF THE OPPONENTS COUNTERS SO ''SANDWICHED''');
28      WRITELN('BECOME CAPTURED. THAT IS THEY CHANGE COLOUR.');
29      WRITELN('AS THE NUMBER OF COUNTERS BUILDS UP MORE AND MORE HAVE TO BE');
30      WRITELN('SWAPPED IN EACH MOVE SO THAT OTHELLO IS CLEARLY A TEDIOUS');



31      WRITELN('GAME TO PLAY BY HAND. THIS IMPLEMENTATION USES ''O'' AND ');
32      WRITELN('''X'' TO REPRESENT THE DIFFERENT COLOURS AND EMPLOYS A');
33      WRITELN('STANDARD A-H, 1-8 CHESSBOARD CONVENTION  THE PLAYER WITH');
34      WRITELN('THE GREATER NUMBER OF COUNTERS AT THE END OF THE.GAME');
35      WRITELN('WINS. A PLAYER MAY BE FORCED TO PASS IF NO EMPTY SQUARE');
36      WRITELN('EXISTS WHICH IS ADJACENT TO AN OPPONENT''S SQUARE');
37      WRITELN('IN A LINE CONTAINING ONE OF HIS OWN.');
38      WRITELN;
39      WRITE('PLEASE PRESS RETURN WHEN YOU ARE READY TO PLAY.');
40      READLN
41  END; (*INSTRUCTIONS*)
42  PROCEDURE IDENTIFY; (*ASKS FOR THE PLAYERS NAMES*)
43  VAR I:INTEGER;
44  BEGIN
45      WRITE(      'WHO''S GOING TO HAVE FIRST MOVE? ');
46      I:=1;
47      WHILE (NOT EOLN) AND (I<11) DO
48      BEGIN READ(      CROSS[I]); I:=I+1 END;
49      WRITELN(      'RIGHT ',CROSS,' YOUR SYMBOL IS ''X''');
50      WRITE(      'WHO''S NEXT? ');
51      I:=1;
52      WHILE (NOT EOLN) AND (I<11) DO
53      BEGIN READ (      NOUGHT[I]); I:=I+1 END;
54      WRITELN(      'THANKS',NOUGHT,' MAY THE BEST PLAYER WIN!')
55  END; (*IDENTIFY*)
56  PROCEDURE STARTGAME; (*INITIALIZES GAME BOARD*)
57  VAR ROW:ROWNUM;
58      COL:COLCHAR;
59  BEGIN
60      FOR ROW:='1' TO '8' DO
61        FOR COL:='A' TO 'H' DO
62          BOARD[ROW,COL]:=EMPTY;
```

Computer Country Pty. Ltd.

"THE MICROCOMPUTER PROFESSIONALS"

Thinking of purchasing a microcomputer system or adding to the one you already have? Make a good investment – invest a little bit of time to talk to the professionals at Computer Country. Remember the quality of the after-sales hardware service and continual after-sales software and hardware advice you get is just as important as the price of the system you buy. Come and have a chat with the professionals of Computer Country just once and you'll realise how much help we can be in enabling you to get the most out of your microcomputer system.

Computer Country stocks a wide range of microcomputer hardware including the Apple, Northstar, Commodore, Texas Instruments, NEC, Impact Data and many more. We carry a wide range of software for many systems including the TRS-80. We can also help you in customising software for your specific application.

Our service department not only completely backs up all hardware purchased from us, but invites enquiries from those who have purchased elsewhere and have hard-to-fix problems.

MAKE A SMART MOVE – COME TO

Computer Country Pty. Ltd.

338 QUEEN STREET, MELBOURNE, VIC. 3000
Telephone: (03) 329 7533

MONITOR FUEL CONSUMPTION CONSTANTLY

with the ZEMCO 28, the latest on-board computer from the manufacturers of the CompuCruise.

A true, programmable computer, calibrated to your vehicle, giving information on fuel usage, fuel remaining, time and distance to go until empty, time on trip, distance travelled and fuel used on trip, and more. Easy, push button operation, quick, simple installation.

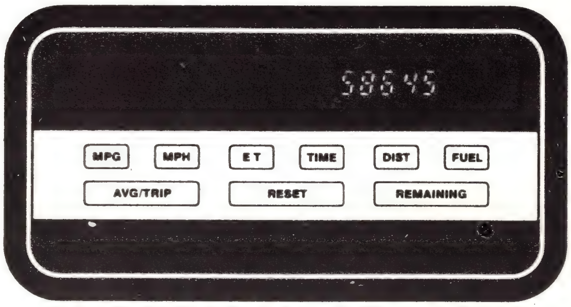
To: Antelope Engineering Pty. Ltd.
P. O. Box No. 271
MILSONS POINT, N.S.W. 2061

YES, please send me further information on ☐ CompuCruise ☐ Zemco 28

My name is. . . . .

and I live at . . . .

. . . . Post Code. . . . . CWM



For further information on the ZEMCO range of on-board computers, and the name of your nearest dealer, call or write to:

ANTELOPE ENGINEERING PTY. LTD.,
68 Alfred Street, Milsons Point, N.S.W. 2061

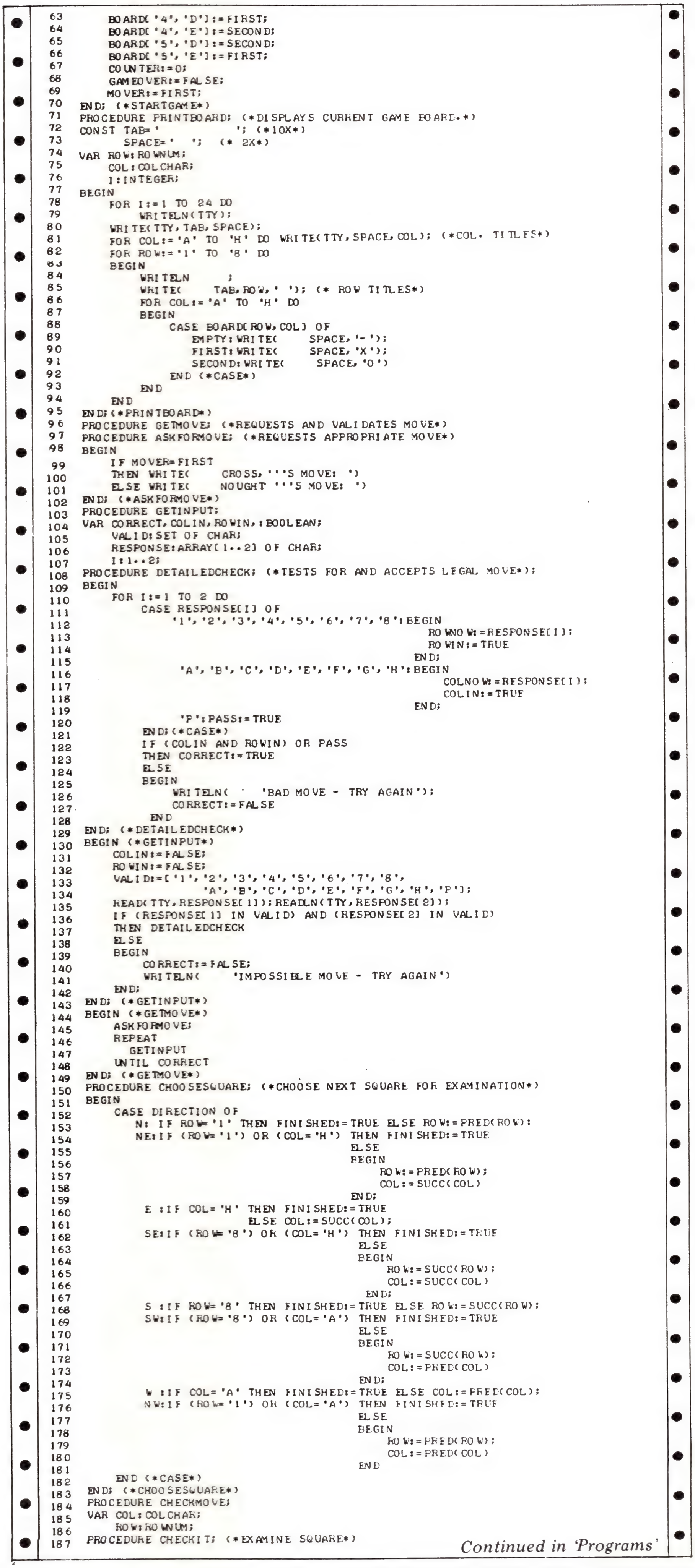
Phone: (02) 929 4033 Telex: 24432

Do it today, for more information at your figertips than you have ever had before.

Note the use of BOOLEANS (GAMEOVER, NOMORE, LEGAL and PASS) to make the control structures (both loops and conditionals) obvious and easy to read. During the game, MOVER keeps tabs on whose move it is (lines 293 to 295) and COUNTER monitors the number of successful moves made (lines 290 and 295). After a move has been input (procedure GETMOVE), accepted (CHECKMOVE) and made (FLIPS), COUNTER and MOVER are altered to reflect the state of the game.

The core of the program lies in the "move" mechanism described by these three procedures. GETMOVE gets the player's move from the keyboard and determines whether the characters input refer to (any) square on the board. This constitutes a check for *validity*. Note the use of the set VALID (line 133) to guarantee that the CASE selector in DETAILEDCHECK (lines 111 to 121) will find one of the options. Note also that the move can be typed in, in either order — i.e. "4A" will work as well as "A4".

CHECKMOVE checks on the legality of the move, ensuring that the indicated square is unoccupied (line 205) and then "looking" in every direction (lines 210 to 220) to see if a winning sequence of "target" squares exists (i.e. a sequence of the opponent's counters followed by one of the player's own counters). Procedure CHOOSESQUARE handles the different sequences (CASE statement, lines 152 to 182) and checks for the edge of the board, while CHECKIT has the job of tallying up a FLIPCOUNTER for each direction (line 190). Note that CHECKMOVE looks in all directions, even when the move is known to be legal. This ensures that FLIPCOUNTER is set for each direction so that the business of making the actual move (FLIPS, line 223 to 241) is fairly straightforward.



```
 63        BOARD['4','D']:=FIRST;
 64        BOARD['4','E']:=SECOND;
 65        BOARD['5','D']:=SECOND;
 66        BOARD['5','E']:=FIRST;
 67        COUNTER:=0;
 68        GAMEOVER:=FALSE;
 69        MOVER:=FIRST;
 70    END; (*STARTGAME*)
 71    PROCEDURE PRINTBOARD; (*DISPLAYS CURRENT GAME BOARD.*)
 72    CONST TAB='          '; (*10X*)
 73          SPACE='  ';  (* 2X*)
 74    VAR ROW:ROWNUM;
 75        COL:COLCHAR;
 76        I:INTEGER;
 77    BEGIN
 78        FOR I:=1 TO 24 DO
 79            WRITELN(TTY);
 80        WRITE(TTY,TAB,SPACE);
 81        FOR COL:='A' TO 'H' DO WRITE(TTY,SPACE,COL); (*COL. TITLES*)
 82        FOR ROW:='1' TO '8' DO
 83        BEGIN
 84            WRITELN     ;
 85            WRITE(     TAB,ROW,' '); (* ROW TITLES*)
 86            FOR COL:='A' TO 'H' DO
 87            BEGIN
 88                CASE BOARD[ROW,COL] OF
 89                   EMPTY:WRITE(     SPACE,'-');
 90                   FIRST:WRITE(     SPACE,'X');
 91                   SECOND:WRITE(     SPACE,'0')
 92                END (*CASE*)
 93            END
 94        END
 95    END;(*PRINTBOARD*)
 96    PROCEDURE GETMOVE; (*REQUESTS AND VALIDATES MOVE*)
 97    PROCEDURE ASKFORMOVE; (*REQUESTS APPROPRIATE MOVE*)
 98    BEGIN
 99        IF MOVER=FIRST
100        THEN WRITE(     CROSS,'''S MOVE: ')
101        ELSE WRITE(     NOUGHT '''S MOVE: ')
102    END; (*ASKFORMOVE*)
103    PROCEDURE GETINPUT;
104    VAR CORRECT,COLIN,ROWIN,:BOOLEAN;
105        VALID:SET OF CHAR;
106        RESPONSE:ARRAY[1..2] OF CHAR;
107        I:1..2;
108    PROCEDURE DETAILEDCHECK; (*TESTS FOR AND ACCEPTS LEGAL MOVE*);
109    BEGIN
110        FOR I:=1 TO 2 DO
111            CASE RESPONSE[I] OF
112                 '1','2','3','4','5','6','7','8':BEGIN
113                                                     ROWNOW:=RESPONSE[I];
114                                                     ROWIN:=TRUE
115                                                   END;
116                  'A','B','C','D','E','F','G','H':BEGIN
117                                                      COLNOW:=RESPONSE[I];
118                                                      COLIN:=TRUE
119                                                   END;
120                  'P':PASS:=TRUE
121            END;(*CASE*)
122            IF (COLIN AND ROWIN) OR PASS
123            THEN CORRECT:=TRUE
124            ELSE
125            BEGIN
126                WRITELN(  'BAD MOVE - TRY AGAIN');
127                CORRECT:=FALSE
128             END
129    END; (*DETAILEDCHECK*)
130    BEGIN (*GETINPUT*)
131        COLIN:=FALSE;
132        ROWIN:=FALSE;
133        VALID:=['1','2','3','4','5','6','7','8',
134                   'A','B','C','D','E','F','G','H','P'];
135        READ(TTY,RESPONSE[1]);READLN(TTY,RESPONSE[2]);
136        IF (RESPONSE[1] IN VALID) AND (RESPONSE[2] IN VALID)
137        THEN DETAILEDCHECK
138        ELSE
139        BEGIN
140            CORRECT:=FALSE;
141            WRITELN(     'IMPOSSIBLE MOVE - TRY AGAIN')
142        END;
143    END; (*GETINPUT*)
144    BEGIN (*GETMOVE*)
145        ASKFORMOVE;
146        REPEAT
147          GETINPUT
148        UNTIL CORRECT
149    END; (*GETMOVE*)
150    PROCEDURE CHOOSESQUARE; (*CHOOSE NEXT SQUARE FOR EXAMINATION*)
151    BEGIN
152        CASE DIRECTION OF
153           N: IF ROW='1' THEN FINISHED:=TRUE ELSE ROW:=PRED(ROW):
154           NE:IF (ROW='1') OR (COL='H') THEN FINISHED:=TRUE
155                                             ELSE
156                                             BEGIN
157                                                 ROW:=PRED(ROW);
158                                                 COL:=SUCC(COL)
159                                             END;
160            E :IF COL='H' THEN FINISHED:=TRUE
161                          ELSE COL:=SUCC(COL);
162            SE:IF (ROW='8') OR (COL='H') THEN FINISHED:=TRUE
163                                              ELSE
164                                              BEGIN
165                                                  ROW:=SUCC(ROW);
166                                                  COL:=SUCC(COL)
167                                                END;
168            S :IF ROW='8' THEN FINISHED:=TRUE ELSE ROW:=SUCC(ROW);
169            SW:IF (ROW='8') OR (COL='A') THEN FINISHED:=TRUE
170                                              ELSE
171                                              BEGIN
172                                                  ROW:=SUCC(ROW);
173                                                  COL:=PRED(COL)
174                                              END;
175            W :IF COL='A' THEN FINISHED:=TRUE ELSE COL:=PRED(COL);
176            NW:IF (ROW='1') OR (COL='A') THEN FINISHED:=TRUE
177                                              ELSE
178                                              BEGIN
179                                                  ROW:=PRED(ROW);
180                                                  COL:=PRED(COL)
181                                              END
182        END (*CASE*)
183    END; (*CHOOSESQUARE*)
184    PROCEDURE CHECKMOVE;
185    VAR COL:COLCHAR;
186        ROW:ROWNUM;
187    PROCEDURE CHECKIT; (*EXAMINE SQUARE*)
```

Continued in 'Programs'

SOFTWARE

AUSTRALIA'S MOST
COMPREHENSIVE
CATALOGUE

SEAHORSE
supplies more than
470 programmes from:
MUSE / PROGRAMMA / MICROSOFT
MICROSENSE / LIFEBOAT
GEMSOFT
for the
APPLE
CBM 'PET'
TRS-80
SORCERER
$1.00 inc. p & p refundable with order
Please specify your computer.

SEAHORSE COMPUTER SERVICES
P.O. Box 47, Camden, N.S.W. 2570
Old S. Rd. Razorback, N.S.W.
Telephone: (046) 366 131

COMMODORE

Commodore Business Systems
+ Business Software
= Solution to your Business Problems

Available Business Software includes:—

- General/Creditor/Debtor Ledgers
- Word Processing
- Debtors
- Stock Control
- Integrated Debtors/Stock Control
- Cost Estimation
- Price Lists
- Random Sort
- Planning
- Real Estate Rent Role.

For System Design at a realistic price, contact us now:—

MICROCOMP
MICROCOMPUTER SYSTEMS DESIGNERS

bankcard
welcome here

B.S. MICROCOMP,
4th floor,
561 Bourke Street,
MELBOURNE, 3000.
Tel: 614 1433 / 614 1551

Have a peek....

Just a selection of books available from Australia's largest range of computer literature.

Microcomputers for Business Applications (Barden)	$11.95
Getting Acquainted with Microcomputers (Frenzel)	$11.95
Microprocessor Cookbook (Horseski)	$ 7.50
6502 Software Gourmet & Cookbook (Scelbi)	$16.80
PET-CBM Personal Computer Guide (Donahue)	$20.50
Introduction to the Computer (Fuori)	$12.95
6502 Assembly Language Programming (Leventhal)	$16.20
Data Processing with Applications (Condon)	$17.95
Microcomputers/Microprocessors: Hardware, Software & Applications (Hilburn)	$30.50
Minicomputer Systems (Lines)	$26.95
Microprocessors; Technology Architecture & Applications (McGlynn)	$19.00
Microprocessors & Microcomputers (Tocci)	$22.95
Handbook of Microprocessors, Microcomputers & Minicomputers (Lenk)	$24.25
Microcomputers: A Technology Forecast & Assessment to the Year 2000 (Wise)	$22.35
The Art of Digital Design (Winkel)	$33.75
Computers in Business (Sanders)	$ 9.75
Minicomputer Systems: Organization, Programming & Applications (Eckhouse)	$30.95
Microprocessor Programming & Software Development (Duncan)	$34.95
The Basic Cookbook (Tracton)	$ 6.50
Pascal: An Introduction to Methodical Programming (Findlay)	$15.00
Problem Solving Using Pascal (Bowles)	$14.25
Structured Walkthroughs (Yourdon)	$33.75
Managing the Structured Techniques (Yourdon)	$33.75
Structured Design (Yourdon)	$28.50
Distributed/Micro/Minicomputer Systems (Weitzman)	$30.50
Structured Computer Organization (Tanenbaum)	$16.95
Crime by Computer (Parker)	$ 7.50
8080A/8085 Assembly Language Programming	$16.20
Architecture of Microcomputers (Greenfield)	$33.75
Syntax of Programming Languages (Backhouse)	$27.75
Structured Analysis & Systems Specification (De Marco)	$33.75
EDP Costs & Charges: Finance, Budgets & Cost Control in Data Processing (Cortada)	$33.75
Computer Organization, Hardware/Software (Gorsline)	$26.95
Introduction to Data Processing (Popkin)	$19.95
Computer Power of the Small Business (Sippl)	$ 8.95
From Television to Home Computer (Robertson)	$21.80
Basic & The Personal Computer (Dwyer)	$15.95
A Guide to Fortran IV Programming (McCracken)	$20.95
Microprocessors & Microcomputers (Huggins)	$12.50
Minicomputers: Structure & Programming (Lewis)	$19.05
Microcomputer Primer (Waite)	$10.75
Microcomputer-Analog Converter, Software & Hardware Interfacing (Titus)	$12.95
Computers in Action (Spencer)	$ 8.00
Microcomputer Interfacing (Artwick)	$24.25
Digital Circuits & Microcomputers (Johnson)	$25.75
The Cobol Environment (Graver)	$26.96
Successful Data Processing System Analysis (Gildersleeve)	$22.95
Programming in Basic for Business (Bosworth)	$13.25
The 8086 Book (Rector & Alexy)	$22.50
Flowcharting & Basic (Edwards & Broadwell)	$12.95
Learning Basic Fast (De Rossi)	$10.95
TRS—80 Interfacing book 1 (Titus)	$11.95
TEA: An 8080 — 8085 (Titus)	$11.95
Information Systems Through Cobol (Philippakis & Kazmier)	$13.90
The S-100 & Other Micro Buses (Poe & Goodwin)	$ 7.95
EDP Concepts Course (NCR)	$19.95
RPG & RPG 11 Programming Applied Fundamentals (Bux & Cunningham)	$22.95
Introduction to Pascal (Welsh & Elder)	$13.95
Basic Programming Primer (Waite & Pardee)	$11.95
"808" Software Gourmet Guide & Cook Book (Scelbi's)	$ 4.99
Learning Level 11 (Lien)	$20.00
Computer Programming for the Complete Idiot (McCunn)	$ 9.95

McGill's Authorised Newsagency Pty. Ltd.

187-193 Elizabeth Street (Opp. G.P.O.), Melbourne, 3000.
Tel. 60 1475, 60 1505

Mail Order Welcome. Credit card accepted. Postage: local $1.25, interstate $1.70

With the advent of office computerisation, the great God 'productivity' seems set to invade the white collar world. Malcolm Peltu reports the possible consequences . . .

The Politics of IT

"If Karl Marx were living now he would not have written *Das Kapital,* he would have written *Die Information."*

Jan Freese, Director General of the Swedish Data Inspection Board uses this quote by a Swedish MP to highlight the essentially political nature of the impact of Information Technology (IT) in his book, *International Data Flow.* In Australia, the main focus of attention in this political debate has been the Chip Shock Horror of mass unemployment predictions. However, a myriad of other issues are beginning to be unearthed.

The question of computers micros and employment is in fact the latest chapter in the long running saga of automation and the quality of working life. Charlie Chaplin's *Modern Times,* made in 1936, graphically exposed the inhumanity of automation, with the human worker becoming a cog in a production machine. In social sciences jargon, Chaplin was attacking 'Taylorism', a technique of 'scientific management' (based on the theories of Frederick W Taylor) which became popular in the 1920s and 30s.

Taylorism promoted the belief that there is an optimum method of organising working methods, which can be analysed scientifically using measurements such as those gained by time-and-motion studies. Taylorism gives little emphasis to worker participation in decision making. The idea is that management defines the 'best', ie. the most cost-effective and productive way of operating . . . that staff then carry out their pre-determined tasks and are rewarded financially.

After the second World War, the 'Human Relations' movement began to get a grip of the working environment, stressing 'job enrichment', personal motivation and satisfaction as important goals, in addition to the pure financial/productivity work relationships fostered by Taylorism.

The de-humanising and de-skilling impact of the first wave of automation occurred in the manufacturing industries. Most of the job enrichment ideas have been applied to white collar office, professional and administration work, although there have been many experiments in manufacturing industry, particularly in Scandanavia, where production is based on worker 'cells' that give worker involvement in job design to help overcome the alienating results of Tayloristic production lines.

The shadow of Taylorism now looms over the office. New IT techniques like word processors, office information systems and computerised telephone and electronic message exchanges for the first time enable white collar productivity to be measured in the same way that manufacturing output rates can be quantified. 'Improved productivity' has become the sales catch phrase for advanced IT office systems. Whatever the impact of the electronic office on the quantity of employment, there's little doubt that it could greatly affect the quality of working life. Unless care is taken to start this process by giving weight to the human factors in the working environment there could be an unthinking and painful resurgence of Taylorism; this time however the unions are organised, forewarned and antagonistic to attempts to turn office workers into white collar cogs.

This aspect of the quality of working life was given scant attention in the early flush of waffle about the silicon chip. The union's desire to have a say in the introduction of technology through negotiated technology agreements is now bringing IT into the forefront of industrial relations negotiations. A good starting point for gaining an insight into the 'work-humanisation' philosophy is the book *The Quality of Working Life in Western and Eastern Europe.* Although it slips frequently into socio-technical jargon (even the Quality of Working Life is abbreviated to QWL) it provides an historical perspective to current developments and covers a wide range of related issues.

The 15 contributors to the book are active practitioners and researchers on the subject and are generally committed to an ideological belief that worker participation in decision making is a Good Thing.

Professor Geert Hofstede of the European Institute of Advanced Studies in Management Techniques puts the political perspective bluntly: "Management must be willing (or forced by circumstances) to let some control be taken away from it". He characterises employers and managers as a 'ruling elite' and the QWL enthusiasts as a 'revolutionary elite' who could trigger a third industrial revolution based on the humanisation of work. He accepts however that the revolutionary elite are frequently out of touch with the workers and are generally content with a gentle palace revolution in co-operation with management. Worker participation, he believes, will eventually breach the palace walls.

Although other contributors may not express themselves in as strong political terms as Professor Hofstede, this sentiment is generally echoed and should be taken into account when reading the book (which has a high propaganda content for particular QWL methods). There is, however, considerable discussion on how to provide objective criteria for nudging the benefits of more participative approaches to work design and the sections on Eastern Europe show that the problems – and attempted solutions – are not confined to the West.

Those who fear that any discussion about worker participation in the introduction of technology is a Trojan Horse containing a band of luddite Reds will quickly become paranoid after reading *Is a Machine After Your Job,* by Chris Harman; it's subtitled 'New Technology and the struggle for socialism'. This is unadulterated propaganda. It provides, however, a reasonable potted summary of the nature of IT and its potential impact and uses.

Despite its strident tone – perhaps because of it–this is an important contribution to the discussions on IT because it vividly highlights the negative 'gut' fears that lurk behind the responses from the 'responsible' trade union movement. In general, trade unions have welcomed the application of new technology but have asked for participation in its introduction and suggested that a framework be created to encourage its innovation while minimising the human costs and giving staff the benefits of improved productivity.

Harman, however, points out (in bold type) that "Workers of one sort and another have the power to impede the introduction of the new technology. The employing class cannot work it without us". Even if workers do not use this power to further their cause, it's clear that new technology will be used as a weapon in many industrial relations battles– and Harman provides a crude insight into the fears and reactions that may predominate.

In the numbers game which predicts the levels of unemployment that may result from IT, the potential for the generation of new jobs is a strong card played by the optimists. Last year, these optimists jumped with delight on a report produced by the Massachusets Institute of Technology (MIT) which said that two-thirds of new jobs in the US were created by firms employing fewer than twenty people. This seemed to boost the idea that new innovative companies could balance the predicted job losses with job gains.

Whether or not IT contributes significantly to unemployment, there's no doubt that there will be much of it (unemployment) around in the next few years. An interesting set of papers on the 'culture of unemployment' is contained in a special issue of the *New Universities Quarterly*, published by Oxford Press. The social and psychological experience of unemployment, responses to high unemployment from the educational system and the growth of the 'black economy'– or moonlighting jobs 'on the side' – are discussed thoughtfully and with much good research.

The political consequences of IT are not limited to the workplace, or even within national boundaries. As Jan Freese points out: "Computer and telecommunications technologies have no limits. Neither political nor geographical boundaries constitute an obstacle to the flow of data. No customs official, however zealous, can stop the information which, via satellite, races at incredible speeds between countries and continents".

The Swedish government is so concerned about the political implications of international data flows and the vulnerability of computer systems to misuse that it has established a committee within the Ministry of Defence to study the implications of allowing computer systems to fall into 'enemy' hands during some external or internal conflict. This committee concluded that it was not in the interests of Sweden that data processing operations outside the country affecting Swedish citizens, business and government should take place without Swedish control: "For certain types of data and particular applications, vulnerability risks are so high that processing abroad should not be permitted . . . The use of computer power abroad should in principle be preceded by consultation" the committee concluded.

In his concise booklet, Freese explains why there is a growing international move towards establishing guidelines covering worldwide data flows. These guidelines are likely to include a clause which insists that information should be 'traded' with other countries only if the country in which the data is stored or processed has data protection laws.

IT therefore sends its tentacles out into the entrails of new political conflicts as well as burrowing down into some old sores. Perhaps it will take an electronic Charlie Chaplin to bring to life the human (or dehumanising) face of IT.

LOOKY VIDEO

INDEPENDENT IMPORTERS/
MANUFACTURER

OHIO SCIENTIFIC COMPUTERS
HARDWARE

1. MEMORY EXPANSION BOARD, 8K. The Double sided Plated through the Board has 8K of wired sockets with driver and buffer I.C.'s and R.F. filters. Add 2114's as you require RAM KIT	$120.00
Fully assembled and tested, extra	$15.00
2. 4K RAM Memory Expansion Chips. 2114, 450nS	"CHEAP"
3. R.F. Modular, 5 to 9 Volt, all channels	$19.95
4. SUPERBOARD II Cover/VDU Stand	$18.95
5. SUPERBOARD II COMPUTER 8K ROM, 4K RAM	$389
6. CHALLENGE C1P COMPUTER 8K, ROM, 4K RAM	$489
7. CHALLENGER C4P COMPUTER Sound NTSC Colour	$946.20
Available soon — P.A.L. conversions for	$80.00

FROM 1st SEPTEMBER ASK FOR NEW PRICE LIST.

NEW PROGRAMMES for OHIO — SOFTWARE

UTILITIES:

U.16. Filename, for cassettes	$8.95
U.17. Trace	$11.95
U.18. Packer — (K saver)	$14.95
U.19. Cursor — C2/4	$11.95
U.20. Mini Assembler	$9.95
U.21. Single-Key Basic	$9.95

INSTRUCTIONS:

I.11. Disassembled ROM, with comments	$12.95
I.12. 32x64 Character Display	$12.95
I.13. Wp 6502 Word Processor Book	$3.95
I.15. Sound Port SII/CIP	$6.95
I.16. G.T. Conversion, X2	$2.95
I.17. Saving Data on Tape	$6.95
I.18. CIP Tape Control	$6.95
I.19. CIP Beeper	$6.95
I.20. CIP/Base 2 Printer	$6.95
I.21. Morse Code Converter & Tape	$16.95
I.22. 32x64 Character Supplement to I.12. 100% hardware Method	$4.95

BUSINESS:

B.4. Savings and Loan Package	$14.95

bankcard
welcome here

GAMES:

G.25. Alien Invaders (Like Space Invaders)	$9.95
G.26. Orbital Lander	$11.95
G.27. Escape from Mars, 2 tapes	$18.95
G.28. Death Ship, 2 tapes	$18.95
G.29. Startrek	$9.95
G.30. Air Sea Battle	$9.95
G.31. Cannoneers	$9.95
G.33. Grand Prix	$9.95
G.35. Avalanche	$9.95

BOOKS/MAGAZINES/CATALOGUE

T.1. The First Book of OSI	$16.95
T.2. Aardvark Journal (6 issue)	$10.95
T.3. Basic Handbook, David Lien	$15.95
K.2. The First 100 items of Software (catalogue)	$3.50 plus $1.00 P&P

also
NOW AVAILABLE blank DIGITAL tapes
C-10 . . . . .$1.85 less for lots of 10 or 100.

Postage:

1 or 2	$1.00
3 — 5	$1.50
6 — 9	$2.00
10 or more	$2.50

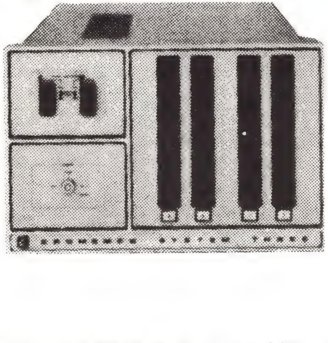
All prices are subject to change without notice.

All prices INCLUDE Sales Tax.

More new lines of software available — enquire.

MAIL ORDER: Cheque or Bankcard

LOOKY VIDEO,
P.O. Box 347, Richmond, 3121, Victoria.
418 Bridge Rd, Richmond. Tel.(03) 429 5674



Cromemco
incorporated
Tomorrow's Computers Today

In the microcomputer field, the Cromemco System Three and Z-2H Winchester Hard Disc Systems stand alone in the range of features and capabilities offered. These systems are based on the Z-80A chip, and have from 1-4 mbytes of diskette storage, and from 10-80 mbytes of hard disc storage, combined with the widest range of software available in the industry, including Multi-user, Multi-tasking operation.

The computers have a large S100 motherboard and the operating system is a Superset of CP/M, thus allowing a wide range of non-cromemco hardware and software to be used. This also provides "obsolescence insurance". Some of these features include high resolution colour graphics, Eprom programmers, remote terminal emulation, and card reader interfaces.

Cromemco Basic, available in 3K, 16K, and 32K structured/KSAM versions, is fast, efficient, and ideal for teaching purposes because of it's dynamic error trapping on entry, and easy file handling. Cromemco Fortran IV and Cobol are equal in power to those found on mainframes, and of course, Pascal, C, and other high level languages are also available.

Informative Systems, Cromemco's authorised centre for sales and service, have installed many systems throughout Australia, backed by Cromemco trained technical staff offering maintenance, support and user training.

INFORMATIVE SYSTEMS Pty Ltd
Specialists in professional microcomputers and high performance computer support products.
3 Bank Street, South Melbourne, Vic 3205
Sydney (02) 680 2161
Telephone (03) 690 2284 Telex 30458 INSYST

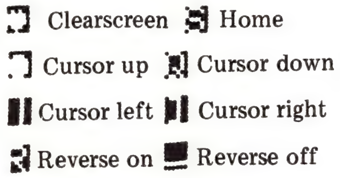
COMMUNICATION

APC welcomes correspondence from its readers. Be as brief and concise as possible and please add "not for publication" if your comments/questions are to be kept private.
Address letters to: "Communications", Australian Personal Computer, P.O. Box 115, Carlton, Vic. 3053

PET graphics

Not being a PET owner, I find it difficult to either interpret or implement some of the programs written for the PET, and other machines with a non-ASCII character subset, which you publish. Since I do not know the meaning or function of the specific graphic characters and reverse characters which are reproduced in the listings, it makes understanding how the screen displays work rather a hit and miss affair. I have not seen an explanatory table for these non–standard' characters anywhere. – can you help?
G. Holman.

We'd be glad to Mr Holman, here's the key – Ed.



Sorcerer tips

Despite claims to the contrary, there is no GET statement in Sorcerer BASIC. It is, however, possible to simulate a GET statement using a machine code routine that is POKE'd in from BASIC.

The statements are as follows:

```
firstly,
FOR X = 1 to 14
READ W
POKE 223 + X, W
NEXT X
DATA 62, 0, 50, 240, 0, 205,
9, 224, 200, 50, 240, 0, 201,
0.
then,
POKE 260, 224
POKE 261, 0
```

To use this routine:
V =USR (0): A=PEEK (240)
A now has the value of the ASCII code of the last key to be pressed.
If no key is pressed then A = 0.

An example is shown below:

```
10  PRINT "DO YOU WANT TO CONTINUE"
20  V = USR (0) : A = PEEK (240)
30  IF A = 0 THEN 20
40  IF A = ASC ("Y") THEN 80
50  IF A = ASC ("N") THEN 100
60  PRINT "RESPONSE INVALID"
70  GO TO 20
80  REM Do something
90  GO TO 10
100 END
```

To control a printer from BASIC, rather than from the monitor, USE the output vectors:

```
      7FD0 H   32720 D
and   7FD1 H   32721 D
```

The contents of these locations will change depending on the output option selected. To turn on the line printer (Centronics) POKE 32720, 147 and to switch it off again POKE 32720, 240. (A word of warning, we've found that if we mess about in the monitor before executing POKE 32720, 147 we lose our program entirely – some caution is needed).
Rob Beynon.

Sold out

I wish to congratulate you on your excellent publication. Each month I look forward to reading APC and in particular, David Levy's Computer Games.

Unfortunately I often have to trek into town to purchase my copy as the local newsagency which carries APC tends to sell out quickly. When are ALL newsagencies going to carry Australian Personal Computer?

I. Davies, Sandringham.

We're working on it. If you are still having difficulty I have several suggestions:

1) *Ask your newsagent to order you a copy each month; or*
2) *Pay a visit to a local computer store and if they don't carry APC . . . they should.*
3) *If all else fails, or if you are feeling lazy, send $2.00 to APC subscriptions Dept. and they will send you a copy pronto.*

Cassette control

To record or pick up data from cassette, it is often necessary to wind the cassette to the appropriate starting point. Pulling out the remote control plug from the recorder every time is inconvenient, inelegant, and wears out the connecting wire. This simple subroutine enables the cassette recorder to be controlled manually, while program execution can be resumed at any time.

```
10000 PRINT "CONTROL
PASSED TO CASSETTE":
PRINT "TO RETURN
TO KEYBOARD HOLD
ANY KEY DOWN"
10010 C$=INKEY$:IFC$<>
""""THENCLS: RETURN
ELSE PRINT # – 1,
C$: GOTO10010
```

I have not seen this solution to a common problem anywhere else.
Dominic Case, Eastwood, N.S.W.

NEW! Apple® software from Micro-Educational

Looking for software that works?
Try micro-Educational. We're very selective about what we sell. We like the repeat business.
Our catalogue represents the 'top 5%' of US and Australian software. Here is a sample:
Z.E.S. the serious CAI and CMI system. A substantial authoring system representing 5 man-years of professional programming input. Hi-res animated colour graphics. Suitable for secondary and tertiary level material. 104 page manual. 3 disks. $250. Sample disk available – $10.
3-D Animated Graphics. subLOGICS's powerful machine language software for the serious graphics user. Allows you to create 3-D figures from their 2-D co-ordinates and then view the figure from any perspective. Animation changes 3 times per second. 116 page manual. $69.50.
CONFLICT. Roger Keating's classic intelligent wargame. Real time action with the challenge of chess. Spectacular graphics. 32K disk or cassette. $25.
Interested? Here's the coupon. (P.S. If you're quick we might even tell you where to buy cheap disks.)

Yes, I'm tired of buying junk software. Please send me your catalogue of the best US and Australian software.

Name ....
Address .... Postcode ....
Post now to:
MICRO-EDUCATIONAL, 17 Park Road, Garden Suburb, N.S.W. 2288 Australia
SPECIALISTS IN CAI, EDUCATION AND ADMINISTRATION SOFTWARE

AUSTRALIAN
Personal Computer

FEATURE INDEX

Benchtest Evaluations
Compucolor II 1-1
Cromemco System Three 1-2
TRS-80 Model II 1-3
Hewlett Packard HP85 1-4
Texas TI 99/4 1-4

Series
The Complete Pascal 1-1,2,3,4
David Levy's Games 1-1,2,3,4
Gateways to Logic 1-4
Face to Face – the man/machine interface 1-4
Business Computing 1-1,2
Fact Sheets (Fax)
  8080 opcodes 1-2
  Z80 opcodes 1-3
  6502 opcodes 1-4
Users Group Index (incl. updates) 1-2,3,4

Personal Opinion (Interrupt)
A chance for the disabled 1-1
Micro Mania 1-2
Frogs on the hop – (The Nora report –) 1-2
Animistics – a look at 'friendly computers 1-3

Evaluations
System 80 (Checkout) 1-2
Exatron Stringy Floppy 1-3

Special Features
3-D Plotting (BASIC) 1-3
Simple Approach to Programming 1-3
"Finger-printing" sentence structure (literary forgeries) 1-2
ESP testing 1-2
M68000 preview 1-3
Apple III report 1-3
Education Report 1-1
Newcomers Start Here – (beginners guide) 1-4
Review of Alvin Toffler's *The Third Wave* 1-4
Begin End 1-1
The Multilingual Machine 1-1
Faster Programming 1-2
Random Writings 1-2
Random Writings Resumed 1-4
Choosing a System 1-3
Z80 Control Signals 1-3
Programming the Simple Approach 1-3
Adding a Z80 to a 6800 system 1-4

Programs
Efficient Character Storage – Z80 Assembler code 1-1
*TRS-80 Graphics Utility – BASIC 1-3
Apple Worms – BASIC 1-2
Acronyms – BASIC 1-2
3D Noughts and Crosses – TRS-80 BASIC 1-4
Challenge from Space – TRS-80 BASIC 1-1
PETs and Tanks – BASIC 1-1
Word Processor – Sorcerer BASIC 1-3
Robot NIM for PET– BASIC 1-3
Fox and Hounds – TRS-80 BASIC 1-1
BASIC string handling routines 1-1
Space Slalom – Apple BASIC 1-3
*Variable Map – TRS-80 BASIC 1-2
*TRS-80 Disable (reprinted 1-3) 1-1
*Byte Saver (packing programs)–TRS-80 BASIC 1-3
PET Backgammon – BASIC 1-4
*Sound for the TRS-80 BASIC 1-2
PET Alien Attack 1-2
*with machine language subroutines

Any one issue $2.80; Any two issues $5.20; Any three issues $7.50; Four issues $9.70. All prices include post and packing. Cheque or P.O. payable to Australian Personal Computer, P.O. Box 115, Carlton, 3053. Please allow up to 3 weeks for delivery and don't forget to state clearly your name and full address with your order. Please send me the following copies of APC. I enclose a cheque/P.O.

for $ ....

Volume 1 No.* ☐1 ☐2 ☐3 ☐4

Name ....

Address ....

....

* Tick appropriate boxes.

ISSUE INDEX

Volume 1 No. 1 May 1980
Benchtest: CompucolorII/ Education Report/Computer Games/ Business Computing I/Begin. . . End/ Help for the disabled/The Complete Pascal/The Multilingual Machine/ Programs: Efficient Character Storage, Challenge from Space, Fox and Hounds for the TRS-80, PETs and Tanks, String Routines, TRS-80 Disable.

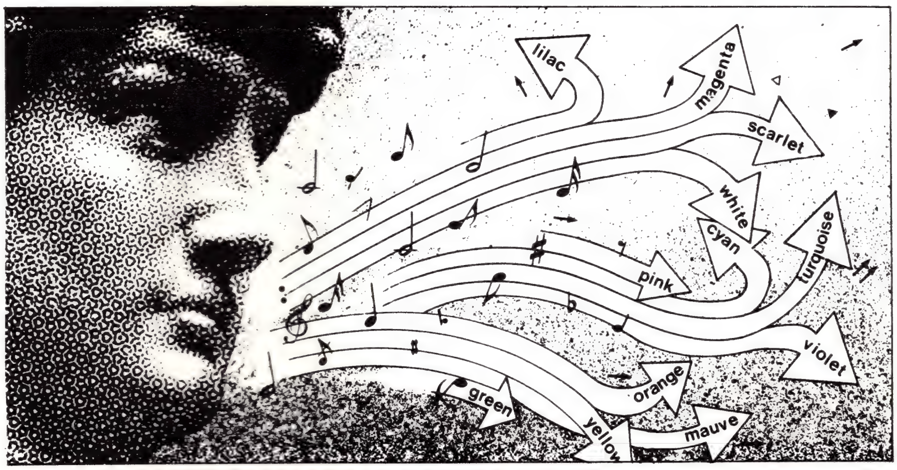
Volume 1 No. 2 June 1980
Benchtest: Cromemco System Three/Shakespeare BASIC and the CIA/Business Computing II/ESP: Psychic Perception – or Deception/ Checkout: System 80/ Faster Programming/ The Complete Pascal/Interrupt: Frogs on the Hop, Micro Mania/Computer Games: And Then There Were Two/ Random Writings/Fax: the 8080 instruction set/ Programs: Sound for the TRS-80, Apple Worms, Variable Map, Acronyms, Alien Attack.

Volume 1 No. 3 July 1980
Yankie Doodles: Apple III report/Benchtest: TRS-80 Model II/ Animistics/ M68000–Motorola's Sweet 16/Computer Games: the Alpha-Beta algorithm/ Plotting in Three Dimensions/The Complete Pascal/ Checkout: Exatron Stringy Floppy/ Choosing a System/ Practising a Little Micro-control/ Programming – the Simple Approach/Fax: Z80 instruction set/ Programs: Byte Saver, TRS-80 Graphics, Word Processor, Space Slalom, Robot Nim for PET.

Volume 1 No. 4 August 1980
Benchtest 1: Hewlett Packard HP85/Benchtest 2: Texas TI 99/4/Gateways to Logic/Face to Face/ Best of Both Worlds/Random Writings Resumed/ Computer Games: speeding up the search/Newcomers Start Here/Bookfare/The Complete Pascal/Fax: 6502 mnemonics/Programs: 3D Noughts and Crosses, PET Backgammon.

"We can't prevent him from looking but surely we can do something to stop him changing the channels"

WHISTLE UP A COLOUR ON YOUR APPLE II/ITT 2020



Using only the cassette data input port of the Apple system (plus a microphone/pre-amp.) the software described here provides a technique to generate effects or alter program direction as a result of the user whistling at different frequencies. R. W. Lawrence BSc explains. . .

Illustration by N. E. One

Cassette input port

Unlike some microcomputer systems available at present which allow the transfer of data to and from a cassette recorder, the Apple II and ITT 2020 depend virtually entirely on software for analysing the output from the cassette when reading data, and generating a suitable signal for it when writing data. This means that the data is available to the processor in virtually the same form as it is recorded on the tape, with only a Schmitt in between to "clean" it up a bit; it's not buffered off from it by a p.l.l. or frequency comparator. This means that one can perform various functions on the signal fed into the data input (which of course, doesn't necessarily have to have come from a cassette recorder. This is, however, probably the best way to start as it will already be hooked up).

Period measurement

By deriving a means to measure the frequency or period at this point, the value obtained can be used by other programs for control or effect . . . or anything else.

In this case the result determines the colour of a pattern displayed in the lo. res. graphics mode. The number of other applications of the technique are only limited by the user's imagination.

Whistling is chosen as the best input (when using a microphone) as it gives a purer waveform than, for instance, voice input. Hence results are more reliable (see later, however).

Software

The technique produces a number proportional to the period of the incoming signal by starting a counter at a 1 to 0 transition and stopping it as soon as a 0 to 1 transition is encountered.

One sample of the period measurement would probably do on its own if the signal to be measured were clean (a pure sinewave or squarewave for example), but there are bound to be various discontinuities or extraneous noises involved too and these will almost inevitably cause errors.

To get round these problems not just one, but sixteen samples are taken and the results stored in memory.

Averaging

In the next stage all the sixteen samples are added together, the result being stored in memory (two bytes). This value is then divided by sixteen to yield the average value of all the samples. This has a far greater chance of being representative of the actual period than the value obtained from a single measurement.

Initially this part of the program was done in BASIC with only the period measurements in machine code; but the BASIC section proved too slow for most applications and so the averaging is now included in the machine code section.

The sixteen samples are stored in memory locations 0300-030F. Locations 0310-0325 contain the subroutine which actually carries out the period measurement, whilst locations 0350-037F is the averaging program. The control program (0330-0348) calls up the above two subroutines, and also determines the number of samples to be taken and where they are stored.

Locations 0328 and 0329 hold the low and high order bytes of the sum of the samples, and the final average value is stored in location 038F. This can be examined when in BASIC by PEEKing (911).

Source code

The programs are fairly self-explanatory. The division by sixteen is performed by a right shift operation done four times, from location 0329 through the accumulator. Since none of the period samples taken could be greater than 225_{10}, it follows that the average must be less than this too — hence the result must fit into the accumulator.

Basic program

This program puts the colour display up on the screen, and after calling up the machine code program, varies the colour of the display depending on the

```
Listing
0300
  01
  02                                   Storage locations
  03                                   for period measurements
  04
   |
   |
  OF   A
0310   A9 01       LDA 01              Initialise flags and counter
  12   A2 00       LDX 00
  14   2C 60 C0    BITC060
  17   30 FB       BMI                 Zero yet? No, test again
  19   E8          INX                 Yes: Increment X
  1A   2C 60 C0    BIT C060            One yet? No? Go back and
                                       inc. X
  1D   30 03       BMI                 Yes: Go on
  1F   4C 19 03    JMP 0319
  22   8A          TXA                 Transfer X to A and store
  23   91 FA       STA (FA), Y         final count in relevant
  25   60          RTS                 location. Return.

0330   A9 00       LDA 00
  32   85 FA       STA                 Set up pointer
  34   A9 03       LDA 03
  36   85 FB       STA
  38  A0 00      LDY 00          Zero counter for no. of
                                 samples

  3A  20 10 03   JSR 0310        Call subr. for period measurement
  3D  C8         INCY
  3E  C0 10      CPY 10          16_10 samples taken yet?
  40  F0 03      BEQ             No, repeat. Yes, finished.
  42  FC 2A 03   JMP 033A
  45  20 50 03   JSR 0350        Call averaging subr.
0348  60         RTS             Return to Basic prog.

0350  A9 00      LDA 00          Clear
  52  8D 28 03   STA 0328        storage
  55  8D 29 03   STA 0329        locations.
  58  A0 00      LDY 00          Clear Y reg.
  5A  18         CLC
  5B  79 00 03   ADC 0300, Y
  5E  90 03      BCC             Perform additions
  60  EE 29 03   INC 0329        Increment high order storage
  63  C8         INY             byte on carry
  64  C0 10      CPY 10          All done? No, return
  66  F0 03      BEQ
  68  4C 5A 03   JMP 035A
  6B  8D 28 03   STA 0328        Yes, store low order byte
  6E  A2 04      LDX 04

0370  6E 29 03   ROR 0329        Perform ÷ 16_10 process by 4
  73  6A         ROR A           right shift operations
  74  CA         DEX             through accumulator
  75  E0 00      CPX 00
  77  F0 03      BEQ             4 completed? No, return
  79  4C 70 03   JMP 0370
  7C  7D 8F 03   STA 038F        Yes, store result
  7F  60         RTS             Return
```

Basic program listing

```
200  GR
205  CALL 816: W = PEEK (911)
220  IF W < 11  THEN W = 11
230  IF W >  110 THEN W = 110
240  COLOR = INT ((W — 3)/108 * 15)
242  R = RND(1): IF R> 0.5 GOTO 245
243  FOR N=1 TO 19 STEP 2: HLIN(20—N), (20+N) AT
     (20+N): VLIN(20—N), (20+N) AT (20+N): HLIN (20—N),
     (20+N) AT (20—N): VLIN(20—N), (20+N) AT (20—N)
     : NEXT
244  GOTO 205
245  FOR N = 19 TO 1 STEP —2: HLIN (20—N), (20+N)
     AT (20+N): VLIN(20—N), (20+N) AT (20+N): HLIN
     (20—N), (20+N) AT (20—N): VLIN(20—N), (20+N)
     AT (20—N): NEXT
250  GOTO 205
```

Generator listing in M/C code

```
038F                             Location for pitch data
0390  A9 08      LDA 08          Load A with duration
  92  8D 30 C0   STA C030        Toggle Speaker
  95  88         DEY
  96  D0 04      BNE             Decrement X until zero and
  98  E9 01      SBC 01          toggle speaker each time
  9A  FO 11      BEQ             round. Decrement Y too, but
  9C  CA         DEX             only decrement A by 1 after
  9D  D0 F6      BNE             255_10 Y decrements.
  9F  AE 8F 03   LDX 038F
  A2  48         PHA             Variable delay in pitch loop
  A3  A9 03      LDA 03          to tune final o/p frequ. to
  A5  E9 01      SBC 01          match that coming in
  A7  D0 FC      BNE
  A9  68         PLA
  AA  4C 92 03   JMP 0392
  AD  4C 30 03   JMP 0330        Back to main prog.
```

frequency of the incoming signal.

The system assumes the signal has a frequency range from about 400Hz to about 2KHz, this being considered a reasonable range to whistle over. Any measurement yielding values that are outside this preset range are "clipped" into it by lines 220 and 230. Line 240 normalises the measurement into an integer between 1 and 15: ready to set the colour of the pattern to one of the fifteen possible on the system.

Line 242 makes the display slightly more interesting by randomly selecting the "tunnel in" (line 245), or the "tunnel out" (line 243) subroutine. These two subroutines change the colour of about ten concentric squares, the only difference between them being the STEP value which selects motion inwards if —2, and outwards is +2.

Looping

As it stands, the processor remains in a loop in the machine code program awaiting any input to the cassette input port. Whilst in this loop it cannot accept data entered from the keyboard — or anywhere else — only, in fact, from the cassette input. Control can be returned to the keyboard via the usual RESET; control C. If desired this can be remedied by putting in a "look at keyboard to see if the key has been depressed" type of programme between lines 0314 and 0317, and jumping out of the loop if it has. This was omitted to keep the number of machine cycles within the loop to a minimum and thus allow the highest possible frequencies to be measured.

Other applications

The technique has been used successfully in other applications (the one described here was really by way of an example) such as in a software frequency of the incoming signal against time; and, if suitably modified, in speech analysis and synthesis.

A reciprocal machine code program could be added. This would form a generator (using the internal speaker) producing tones of the same frequency as those measured by the above arrangement when presented with the same data. Thus the Apple could "whistle" along with you — albeit rather roughly as it would have to stop every so often to see what you're whistling.

A suitable machine code generator program is also given. It's a modified form of the one listed in the Apple II Reference manual, except that the duration is preset (byte in location 0391) and also a "tuning" factor is added to make sure it "whistles" what it "hears" (using the terms euphemistically). Lines 03A2 — 03A9 perform the latter. Increase the value at 03A4 to flatten the generated frequency for a given input, and reduce it to sharpen the generated frequency.

Linking up

The generator program can be linked in to the analyser program as follows: Line 0348 changes from 60 (RTS) to:
0348 4C 90 03 (JMP 0390).

P.S: If you can't whistle, you'll just have to learn to hum sinusoidally.

NEWCOMERS-START HERE

What follows is a brief guide for the microcomputing novice. It has been designed for quick reference – with all the key words in bold type; of course if you're feeling adventurous, you're welcome to read it right through. Whichever way, we trust you will find it helpful. Happy Microcomputing!

Welcome to the confusing world of the microcomputer. First of all, don't be fooled; there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say "numbering system with a radix of sixteen in which the letters A to F represent the values 10 to 15", when instead we can simply say "hex". No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, APC will be publishing this guide – every month.

We'll start by considering a microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, processing it, storing the results or sending them somewhere else. All this information is called **data** and it comprises numbers, letters and special symbols which can be read by humans. Although the data are (yes, it's plural) accepted and output by the computer in 'human' form, inside it's a different story – they must be held in the form of an electronic code. This code is called **binary** – a system of numbering which uses only 0s and 1s. Thus in most micros each character, number or symbol is represented by eight binary digits or **bits** as they are called, ranging from 00000000 to 11111111.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). As an example of this standard, the number five is represented as 00110101 – complicated for humans, but easy for the computer! This collection of eight bits is called a byte and computer freaks who spend a lot of time messing around with bits and bytes use a half way human representation called **hex.** The hex equivalent of a byte is obtained by giving each half a single character code (0–9, A–F):

0=0000, 1=0001, 2=0010,
3=0011, 4=0100, 5=0101
. . . . . . E=1110 and F=1111.

Our example of 5 is therefore 35 in hex. This makes it easier for humans to handle complicated collections of 0s and 1s. The machine detects these 0s and 1s by recognising different voltage levels.

The computer processes data by reshuffling, performing arithmetic on, or by comparing them with other data. It's the latter function that gives a computer its apparent 'intelligence' – the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in memory as bytes. The rules are called **programs** and while they can be input in binary or hex **(machine code** programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the **programming language** is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **BASIC.** Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To run such a program the computer uses an **interpreter** which picks up each English-type **instruction,** translates it into machine code and then feeds it into the **processor** for execution. It has to do this each time the same instruction has to be executed.

Two strange words you will hear in connection with BASIC are **PEEK** and **POKE.** They give the programmer access to the memory of the machine. It is possible to read (PEEK) the contents of a byte in the computer and to modify a byte (POKE).

Moving on to hardware, this means the physical components of a computer system as opposed to software – the programs needed to make the system work.

At the heart of the microcomputer system is the central processing unit **(CPU)**, a single microprocessor chip with supporting devices such as **buffers**, which 'amplify' they CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board **(PCB)** or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large, PCB; in others a bus system is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function – for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the **S100.**

The CPU needs **memory** in which to keep the programs and data. Microcomputers generally two types of memory, **RAM** (Random Access Memory) and **ROM** (Read Only Memory). The CPU can read information stored in RAM – and also put information into RAM. Two types of RAM exist – **static** and **dynamic**; all you really need to know is that dynamic RAM uses less power and is less expensive than static, but it requires, additional, complex, circuitry to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called **PROMs** (Programmable ROMs) and **EPROMs** (Erasable PROMs) which can programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, **cassettes** and **floppy discs** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and playback information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, floppy discs are used on more sophisticated systems.

A floppy disc is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disc, in its protective envelope is placed in a disc drive which rotates it and moves a **read/write head** across the disc's surface. The disc is divided into concentric rings called **tracks**, each of which is in turn subdivided into sectors. Using a program called a **disc operating system,** the computer keeps track of exactly where information is on the disc and it can get to any item of data by moving the head to the appropriate track and them waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts; **soft sectoring** where special signals are recorded on the surface and **hard sectoring** where holes are punched through the disc and around the central hole, one per sector.

Half-way between cassettes and discs is the **stringy floppy** – a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disc system. Hard disc systems are also available for microcomputers; they store more information than floppy discs, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit **(VDU)**, which looks like a TV screen with a typewriter-style keyboard; sometimes these are built into the system, sometimes they're separate. If you want a written record **(hard copy)** of the computers output, you'll need a **printer.**

The computer can send out and receive information in two forms – **parallel** and **serial.** Parallel input/output (I/O) requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as **baud rate** and, very roughly, the baud rate divided by 10 equals the number of bytes being sent per second.

To ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces the most common is **RS232** (or **V24**) while, for parallel interfaces to printers, the **Centronics** standard is popular.

Finally, a **modem** connects a computer, via a serial interface to the telephone system allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need Telecom's permission; instead you could use an **acoustic coupler**, which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system – Telecom isn't so uppity about the use of these.

Australia's first under $300 COMPUTER...

$295
INCL. ZX80 BASIC MANUAL

Remember — *all prices shown include sales tax, postage and packing.*
N.B. Your Sinclair ZX80 may qualify as a business expense.

sinclair ZX80 -British made.

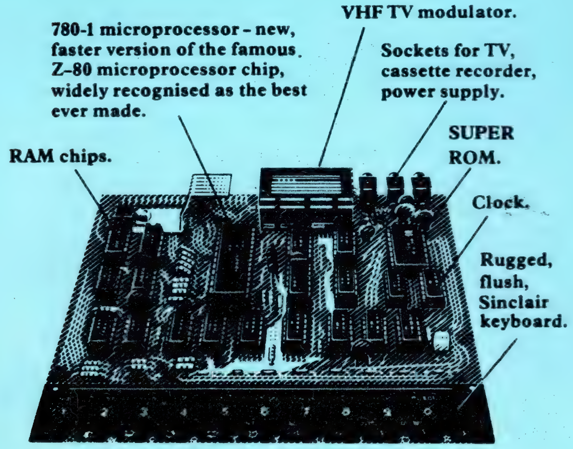
Until now, building your own computer could cost you around $600 — and still leave you with only a bare board for your trouble. The Sinclair ZX80 changes all that. For just $295 you get **everything** you need including leads for direct connection to your own cassette recorder and television. The ZX80 really is a complete, powerful full-facility computer matching or surpassing other personal computers costing much more. The ZX80 is programmed in BASIC and you could use it for anything from chess to running a power station.

Two unique and valuable components of the Sinclair ZX80: the Sinclair BASIC interpreter and the Sinclair teach-yourself BASIC manual. **The unique Sinclair BASIC interpreter:** offers remarkable programming advantages — unique 'one touch' key word entry. The ZX80 eliminates a great deal of tiresome typing, Key words (RUN, PRINT, LIST etc) have their own single key entry. Unique syntax check. Only lines with correct syntax are accepted into programs. A cursor identifies errors immediately, preventing entry of long and complicated programs with faults only to discover them when you run.

Excellent string handling capability — takes up to 26 string variables of any length. All strings can undergo all rational tests (e.g. comparison). The ZX80 also has string input to request a line of text; strings do **not** need to be dimensioned. Up to 26 single dimension arrays. FOR/NEXT loops nested up to 26. **Variable names** of any length. BASIC language also handles full Boolean arithmatic, conditional expressions, etc.

Exceptionally powerful edit facilities, allows modification of existing program lines. **Randomise function,** useful for games and secret codes. **Timer under program control.** PEEK and POKE enable entry of machine code instructions, USR causes jump to a user's machine language sub-routine. **High resolution graphics** with 22 standard graphic symbols. **The Sinclair teach-yourself-BASIC manual** 96 page book **free** with every kit.

Fewer chips, compact design, volume production means MORE POWER FOR YOUR DOLLAR! The ZX80 owes its low price to its remarkable design; the whole system is packed onto fewer, newer more powerful and advanced LSI chips. A single SUPER ROM, for instance, contains the BASIC interpreter, the character set, operating system and monitor. And the ZX80's IK byte RAM is roughly equivalent to 4K bytes in a conventional computer because the ZX80's brilliant design packs the RAM so much more tightly. (Key words occupy just a single byte). You can add to the memory via the expansion port, giving a maximum potential of 16K.



780-1 microprocessor - new, faster version of the famous Z-80 microprocessor chip, widely recognised as the best ever made.
VHF TV modulator.
Sockets for TV, cassette recorder, power supply.
RAM chips.
SUPER ROM.
Clock.
Rugged, flush, Sinclair keyboard.

ORDER FORM: SINCLAIR EQUIPMENT (AUSTRALASIA) PTY. LTD.
308 High St., Kew 3101, Vic. Tel. 861 6224.

Quantity	Item	Item Price	Total
	Ready-assembled Sinclair ZX80 Personal Computer(s). Price incl. ZX80 BASIC manual, excl. mains adaptor.	$295.00	
	Mains Adaptor(s) (600Ma at 9V DC nominal unregulated).	$16.00	
	Memory Expansion Board(s) takes up to 3K bytes.	$28.50	
	RAM Memory chips — standard 1K bytes capacity.	$10.00	
	Sinclair ZX80 Manual(s) free with every ZX80 computer.	$15.00	

I enclose cheque/Bankcard/Diners Club/Amex TOTAL

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name____________________

Address________________ Postcode________

they're here!

LINSAC sinclair ZX80 SOFTWARE

(and more to come)

C-12 CASSETTES, $12

per pack

Including postage & packing

PROGRAMS ON CASSETTE WITH FULL DOCUMENTATION.
ALL PROGRAMS RUN ON BASIC ZX80 SYSTEM UNLESS OTHERWISE STATED.

ZX80 COMPANION 87 PAGE BOOK **$16**

Book is arranged so that the intending user of the ZX80 entering computing may start using the system and gradually gain a better appreciation of the machine and facilities. The informed computer user will find the later sections useful in applying his knowledge to the ZX80 which has brought a breath of fresh air to the personal computer scene.

Linsac Software comes on C12 Cassettes with **Full Documentation** including
• Program Listing • User Instructions • List of Variables with Meanings
• Program Description • Sample Program Run

GAMES PACK ONE CONTAINS

G001 Three Towers
Rearrange the rings to build a new tower.

G002 Number Guessing
Find the hidden number with hints from the ZX80.

G003 Mastermind
Break the four digit code.

G004 Sketcher
Draw patterns of your choice with memory mapping.

G005 Hurkle
Hunt the horrible hurkle in the 15×15 grid.

G006 Nim
The familiar game of skill.

G007 Symbol Simon
Try and match the complex increasing pattern.

GAMES PACK TWO CONTAINS

G008 Nine Lives
A word game for two players — possibly fatal.

G009 The Maze Game
Find the treasure as the maze grows around you.

G010 Plain Sailing
Steer a yacht against dangerous currents.

G012 Noughts & Crosses
The ZX80 plays an excellent strategic game.

G013 Chinese Puzzle
Can you rearrange the blocks in the right way?

G014 Tower of Hanoi
The game of antiquity.

G015 Battleship
Realistic naval artillery action.

GAMES PACK THREE CONTAINS

G011 Fruit Machine (2-4K)
The ZX80 as a one-armed bandit.

G016 Four in a Line (4K)
A 2 player game arranging patterns of counters.

G017 Zombies
You are surrounded by zombies on a desert island.

EDUCATION PACK ONE CONTAINS

E001 Maths Drill
Two levels of aifficulty included.

E002 Dot recognition
Recognise the number of a random dot pattern.

E011 Musical Notes
Teaches children notes on the scale.

E004 Spelling Quiz
The teacher sets five words to be tested.

E007 Day Finder
Gives the day of the week for a date.

EDUCATION PACK TWO CONTAINS

E005 Graph Plotter
Plots quadratic equations.

E006 Prime Factors
Calculates prime factors of given numbers.

E008 Number Bases
Conversions and calculations in different bases.

E009 Bar Charts
Plots bar charts from supplied data.

E010 Statistics
A collection of statistical routines.

UTILITY PACK ONE CONTAINS

U001 Memory Display
Displays 80-byte blocks of memory (char/hex).

U002 Hex Code Monitor
Handles machine code routines.

U003 Renumber
A full renumber routine.

U004 Memory Search
Finds and displays byte patterns.

C-12 CASSETTE ORDER FORM

SINCLAIR EQUIPMENT (AUSTRALASIA) PTY. LTD.
308 High St., Kew 3101, Vic. Tel. 861 6224

Item	Quantity	Total
Games Pack One		
Games Pack Two		
Games Pack Three		
Education Pack One		
Education Pack Two		
Utility Pack One		
ZX80 Book		
	Total	

I enclose cheque/Bankcard/Diners Club/Amex

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name ....

Address .... Postcode..........

ET12

FAX

The 6800 Mnemonics arranged by op code

LSB MSB	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	*	NOP (INH)	*	*	*	*	TAP (INH)	TPA (INH)	INX (INH)	DEX (INH)	CLV (INH)	SEV (INH)	CLC (INH)	SEC (INH)	CLI (INH)	SEI (INH)	0
1	SBA	CBA	*	*	*	*	TAB (INH)	TBA (INH)	*	DAA (INH)	*	ABA (INH)	*	*	*	*	1
2	BRA (REL)	*	BHI (REL)	BLS (REL)	BCC (REL)	BCS (REL)	BNE (REL)	BEQ (REL)	BVC (REL)	BVS (REL)	BPL (REL)	BMI (REL)	BGE (REL)	BLT (REL)	BGT (REL)	BLE (REL)	2
3	TSX (INH)	INS (INH)	PUL (A)	PUL (B)	DES (INH)	TXS (INH)	PSH (A)	PSH (B)	*	RTS (INH)	*	RTI (INH)	*	*	WAI (INH)	SWI (INH)	3
4	NEG (A)	*	*	COM (A)	LSR (A)	*	ROR (A)	ASR (A)	ASL (A)	ROL (A)	DEC (A)	*	INC (A)	TST (A)	*	CLR (A)	4
5	NEG (B)	*	*	COM (B)	LSR (B)	*	ROR (B)	ASR (B)	ASL (B)	ROL (B)	DEC (B)	*	INC (B)	TST (B)	*	CLR (B)	5
6	NEG (IND)	*	*	COM (IND)	LSR (IND)	*	ROR (IND)	ASR (IND)	ASL (IND)	ROL (IND)	DEC (IND)	*	INC (IND)	TST (IND)	JMP (IND)	CLR (IND)	6
7	NEG (EXT)	*	*	COM (EXT)	LSR (EXT)	*	ROR (EXT)	ASR (EXT)	ASL (EXT)	ROL (EXT)	DEC (EXT)	*	INC (EXT)	TST (EXT)	JMP (EXT)	CLR (EXT)	7
8	SUB (A) (IMM)	CMP (A) (IMM)	SBC (A) (IMM)	*	AND (A) (IMM)	BIT (A) (IMM)	LDA (A) (IMM)	*	EOR (A) (IMM)	ADC (A) (IMM)	ORA (A) (IMM)	ADD (A) (IMM)	CPX (A) (IMM)	BSR (REL)	LDS (IMM)	*	8
9	SUB (A) (DIR)	CMP (A) (DIR)	SBC (A) (DIR)	*	AND (A) (DIR)	BIT (A) (DIR)	LDA (A) (DIR)	STA (A) (DIR)	EOR (A) (DIR)	ADC (A) (DIR)	ORA (A) (DIR)	ADD (A) (DIR)	CPX (A) (DIR)	*	LDS (DIR)	STS (DIR)	9
A	SUB (A) (IND)	CMP (A) (IND)	SBC (A) (IND)	*	AND (A) (IND)	BIT (A) (IND)	LDA (A) (IND)	STA (A) (IND)	EOR (A) (IND)	ADC (A) (IND)	ORA (A) (IND)	ADD (A) (IND)	CPX (A) (IND)	JSR (IND)	LDS (IND)	STS (IND)	A
B	SUB (A) (EXT)	CMP (A) (EXT)	SBC (A) (EXT)	*	AND (A) (EXT)	BIT (A) (EXT)	LDA (A) (EXT)	STA (A) (EXT)	EOR (A) (EXT)	ADC (A) (EXT)	ORA (A) (EXT)	ADD (A) (EXT)	CPX (A) (EXT)	JSR (EXT)	LDS (EXT)	STS (EXT)	B
C	SUB (B) (IMM)	CMP (B) (IMM)	SBC (B) (IMM)	*	AND (B) (IMM)	BIT (B) (IMM)	LDS (B) (IMM)	*	EOR (B) (IMM)	ADC (B) (IMM)	ORA (B) (IMM)	ADD (B) (IMM)	*	*	LDX (IMM)	*	C
D	SUB (B) (DIR)	CMP (B) (DIR)	SBC (B) (DIR)	*	AND (B) (DIR)	BIT (B) (DIR)	LDA (B) (DIR)	STA (B) (DIR)	EOR (B) (DIR)	ADC (B) (DIR)	ORA (B) (DIR)	ADD (B) (DIR)	*	*	LDX (B) (DIR)	STX (B) (DIR)	D
E	SUB (B) (IND)	CMP (B) (IND)	SBC (B) (IND)	*	AND (B) (IND)	BIT (B) (IND)	LDA (B) (IND)	STA (B) (IND)	EOR (B) (IND)	ADC (B) (IND)	ORA (B) (IND)	ADD (B) (IND)	*	*	LDX (IND)	STX (IND)	E
F	SUB (B) (EXT)	CMP (B) (EXT)	SBC (B) (EXT)	*	AND (B) (EXT)	BIT (B) (EXT)	LDA (B) (EXT)	STA (B) (EXT)	EOR (B) (EXT)	ADC (B) (EXT)	ORA (B) (EXT)	ADD (B) (EXT)	*	*	LDX (EXT)	STX (EXT)	F
	0	1	2	3	4	5	6	7	8	9	A	B	C		E	F	

DIR = Direct Addressing Mode, EXT = Extended Addressing Mode, IMM = Immediate Addressing Mode, IND = Index addressing Mode, INH = Inherent Addressing Mode, REL = Relative Addressing Mode, A = Accumulator A, B= Accumulator B.

LEISURE LINES

With J.J. Clessa

A very good response to our 'Palindromic' Leisure Lines (over 40 entries) despite the fact that some kind of computerised aid was necessary for the solution – or, alternatively, one hell of a lot of spare time!

In fact, all the answers received were correct ones and the answers are as follows:

1 Alan & Bert's mileometers are palindromic after 321123 miles.

2 Alan & Colin's mileometers after 111111 miles.

3 Bert & Colin's mileometers after 0110 miles.

4 All three mileometers mutually palindromic after 655666 miles.

Thanks to Dave Tebbutt's ability to generate random numbers with extreme rapidity on a borrowed PET (and with Sue Eisenbach on hand to ensure fair play and no program bugs) we were quickly able to select a winning entry – from:

Colin Wheat, Geraldton, W.A.

Congratulations, Mr. Wheat, $22 worth of stamps are on their way – courtesy of the PO.

QUICKIE

Short and snappy for this month, and as usual, no solutions and no prizes.

Which number, when added to 1¼ gives the same result as when it is multiplied by 1¼?

PRIZE PUZZLE

Again, fairly brief for this month.

This time I'd like you to find the smallest palindromic number that is also a perfect square, and which contains an even number of digits. Thus 121 is a perfect square – and also palindromic number – but unfortunately it contains an odd number of digits.

THIS MONTH'S PRIZE

For the lucky winner, a Paper Mate Pen and pencil set – finished in olive green and gold.

USER GROUPS INDEX

Just updates this month.

Micom – 80

A special Interest Group of Melbourne's TRS-80 & System 80 Users Group can be contacted on 560 8132 or write to the Group Chairman, Len Saunders, at 9 Currajong Avenue, Glen Waverley 3150. The group has about forty members and meets on the third Saturday of each month at the Ausom Users Hall.

Mr Ed Richardson informs us of the existance of an Ohio Superboard User Group in Nundah, Queensland. Membership is $10 and all new members receive a complete set of their newsletter. For more information send a large S.A.E. to 146 York Street, Nundah, 4012.

In Victoria, Ian Eyles of 10 Forbes Street, Essendon, (Ph. 375 3478) can be contacted for details of a O.S.I./6502 User Group.

Commodore users groups seem to be springing up everywhere. The latest is the Commodore Computer Users Association of S.A. PO Box 60, Clarence Gardens, 5039. Earle Rowan is the President.

Continued from page 41.

```
BEGIN
     IF BOARD[ROW, COL]=TARGET
     THEN FLIPCOUNTER[DIRECTION]:=FLIPCOUNTER[DIRECTION]+1
     ELSE
     BEGIN
          FINISHED:=TRUE;
          IF BOARD[ROW, COL]=MOVER
          THEN IF FLIPCOUNTER[DIRECTION]:>0
                THEN LEGAL:=TRUE
                ELSE FLIPCOUNTER[DIRECTION]:=0 (*EMPTY*)
      END
END; (*CHECKIT*)
BEGIN (*CHECKMOVE*)
     LEGAL:=FALSE;
     IF MOVER=FIRST
     THEN TARGET:=SECOND
     ELSE TARGET:=FIRST;
     IF BOARD[ROWNOW, COLNOW]=EMPTY
     THEN
     BEGIN
          ROW:=ROWNOW;
          COL:=COLNOW;
          FOR DIRECTION:=N TO NW DO
          BEGIN
                FINISHED:=FALSE;
                FLIPCOUNTER[DIRECTION]:=0;
                REPEAT
                    CHOOSESQUARE;
                    IF FINISHED (**EDGE REACHED**)
                    THEN FLIPCOUNTER[DIBECTION]:=0
                    ELSE CHECKIT
                UNTIL FINISHED
          END
     END
END; (*CHECKMOVE*)
PROCEDURE FLIPS;
VAR ROW:ROWNUM;
     COL:COLCHAR;
     I:INTEGER;
BEGIN
     ROW:=ROWNOW;
     COL:=COLNOW;
     BOARD[ROW, COL]:=MOVER;
     FOR DIRECTION:=N TO NW DO
     BEGIN
          ROW:=ROWNOW;
          COL:=COLNOW;
          FOR I:= 1 TO FLIPCOUNTER[DIRECTION] DO
          BEGIN
                CHOOSESQUARE;
                BOARD[ROW, COL]:=MOVER
          END
     END
END; (*FLIPS*)
PROCEDURE GIVESCORE;
VAR COL:COLCHAR;
     ROW:ROWNUM;
     FIRSTCOUNT, SECONDCOUNT:0..60;
BEGIN
     PRINTBOARD;
     FIRSTCOUNT:=0;
     SECONDCOUNT:=0;
     FOR ROW:='1' TO '8' DO
          FOR COL:='A' TO 'H' DO
               IF BOARD[ROW, COL]=FIRST
               THEN FIRSTCOUNT:=FIRSTCOUNT+1
               ELSE SECONDCOUNT:=SECONDCOUNT+1;
     WRITELN(    CROSS, '            ', FIRSTCOUNT);
     WRITELN(    NOUGHT, '            ', SECONDCOUNT);
     IF FIRSTCOUNT=SECONDCOUNT
     THEN WRITELN(     'IT''S A TIE')
     ELSE IF FIRSTCOUNT>SECONDCOUNT
          THEN WRITELN(     CROSS, ' WINS')
          ELSE WRITELN(     NOUGHT, ' WINS')
END; (*GIVESCORE*)
PROCEDURE ANOTHERGO;
VAR CONTINUE:CHAR;
BEGIN
       WRITE(     'WOULD YOU LIKE ANOTHER GAME? TYPE Y OR N. ');
       READLN(     CONTINUE);
       IF CONTINUE='Y'
       THEN NOMORE:=FALSE
       ELSE NOMORE:=TRUE
END; (*ANOTHERGO*)
BEGIN (*MAIN PROGRAM*)
     WRITE(     'DO YOU WANT TO READ THE INSTRUCTIONS? TYPE Y
     OR N.');
     READLN(     ANSWER);
     IF ANSWER='Y' THEN INSTRUCTIONS;
     IDENTIFY;
     REPEAT
     STARTGAME;
          WHILE NOT GAMEOVER DO
          BEGIN
               REPEAT
                    PRINTBOARD;
                    PASS:=FALSE;
                    GETMOVE;
                    IF PASS THEN LEGAL:=TRUE ELSE CHECKMOVE
               UNTIL LEGAL;
               IF NOT PASS
               THEN
               BEGIN
                    FLIPS;
                    COUNTER:=COUNTER+1
               END;
               IF MOVER=FIRST
               THEN MOVER:=SECOND
               ELSE MOVER:=FIRST;
               IF COUNTER=60
               THEN GAMEOVER:=TRUE
        END;
        GIVESCORE;
        ANOTHERGO
      UNTIL NOMORE
END.
```

So you need advice about Computers...

DICK SMITH'S NEW HOTLINE SERVICE is just a phone call away.

Computers are fairly complex products and customers who have bought them tend to need assistance, advice and support from time to time.
A special "Hotline" service is available to Dick Smith System 80 and Sorcerer computer and peripherals customers. Up-to-the-minute help and advice is available just by phoning (02) 888 2002.
Your consultant, Steven Engel, will be pleased to assist with Dick Smith computer enquiries and will forward comprehensive literature if required.
This new "Hotline" provides a level of service and support without equal in Australia's small computer industry.

special hotline no.
(02) 888-2002

DICKSMITH ELECTRONICS
SYDNEY ● MELBOURNE ● BRISBANE ● ADELAIDE
CANBERRA ● PERTH ● WOLLONGONG

Showpiece

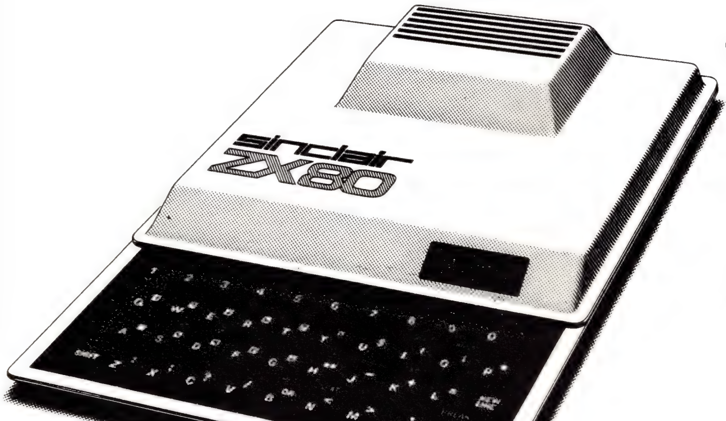
Here's an Apple II program by Les Solomon, technical director of the US magazine *Popular Electronics*. We won't tell you what it does – just type it on and see for yourself!

```
10 DIM P$(8),C$(10),W$(5)
15 P$="PERSONAL"
17 C$="  COMPUTER"
19 W$="WORLD"
20 CALL -936
25 A=30
30 FOR B=2 TO 20: VTAB B: TAB A: PRINT P$;: VTAB B-1:
   TAB A: CALL -868
35 A=A-1
40 FOR C=1 TO 10: NEXT C
45 NEXT B
47 B=2
50 FOR A=2 TO 20: VTAB B: TAB A: PRINT C$;: VTAB B-1:
   TAB A-1: CALL -868
52 B=B+1
55 FOR C=1 TO 10: NEXT C
57 NEXT A
60 B=22
65 FOR A=33 TO 18 STEP -1
67 VTAB B: TAB A: CALL -868: PRINT W$
70 FOR C=1 TO 10: NEXT C
72 NEXT A
75 PRINT : PRINT
77 POKE 50,127: TAB 17: PRINT "PRESENTS": POKE 50,255
80 PRINT : PRINT : TAB 4
81 PRINT : TAB 12: PRINT "THE THIRD ANNUAL"
82 PRINT : TAB 4
87 PRINT "  PERSONAL COMPUTER WORLD SHOW"
92 PRINT : TAB 4: PRINT "    SEPTEMBER 4,5 AND 6, 1980"
95 PRINT : TAB 4: PRINT "CUNARD HOTEL, HAMMERSMITH,
   LONDON"
97 PRINT : PRINT : PRINT
100 FOR X=1 TO 39: PRINT "*";: TAB X: NEXT X
105 FOR X=23 TO 1 STEP -1: VTAB X: TAB 38: PRINT "*";:
   NEXT X
110 FOR X=38 TO 1 STEP -1: TAB X: PRINT "*";: NEXT X
115 FOR X=1 TO 23: VTAB X: TAB 1: PRINT "*";: NEXT X
150 FOR X=1 TO 2000: NEXT X
155 GOTO 20
```

AUSTRALIAN
Personal Computer

Gives you the chance to win

sinclair ZX80



This month we're after an even shorter program than was required in the last competition.
300 bytes is the maximum length –
and all contained in one line number.
So the best 'one-liner'
will carry off this month's ZX80.

Get your entries in by Friday, 24th October, to:

ZX80 Competition,
Australian Personal Computer,
P.O. Box 115,
Carlton, Vic. 3053.

The winner of this second competition will have his/her name immortalised in the November issue of APC.

The Judges decision will be final and no correspondence will be entered into.
Entries should be typed (double spaced); no cassettes please.

PROGRAMS

Dots and Boxes

by Jeff Aughton

Here's an intriguing game written for the Commodore PET (although it shouldn't be difficult to implement on other machines). Full instructions are included within the program, so off you go.

```
140 PRINT"■WANT THE RULES? (Y/N)
150 GETA$:IFA$="Y"THEN8000
160 X=RND(1):IFA$<>"N"THEN150
170 CLR:INPUT"■YOUR NAME  .■■■";N$
180 IFN$<"A"ORN$>"Z"THEN170
190 DIMB%(49),L%(13,19),T%(6),E%(13)
200 C$(0)=LEFT$(N$,1):C$="PET"
210 C$(1)="P"
215 IFC$(0)="P"THENC$=" ME":C$(1)="M"
220 DEFFNA(X)=INT(B%(X)/16)
230 Z$="■               ":D$="":R$=""
240 FORI=1TO25:D$=D$+"■":R$=R$+"■"
250 Z$=Z$+" ":NEXT:Z$=Z$+"■"
260 FORI=2TO8STEP2
270 READC$(I),C(I),C(I+1):NEXT
280 FORI=1TO24:READX:B%(X)=65:NEXT
500 REM DRAW BOARD
510 PRINT"■";:FORI=1TO6
520 PRINT"■■■   ●    ●    ●    ●    ●    ●"
530 NEXT:PRINT"■":FORI=0TO4:PRINT
540 PRINT"■■■  ";:FORJ=0TO4
550 PRINT"   ";CHR$(65+I*5+J);
560 NEXTJ,I
570 PRINT"■■■":FORI=1TO7
580 PRINTSPC(28)"■              "
590 NEXT:PRINT"■■■■"
600 PRINTSPC(31)"■SCORE■"
610 PRINTSPC(29)"■YOU   ";C$;"■■■■■■■■
620 PRINTSPC(29)"BOX SIDES■■
630 PRINTSPC(31)"●-8-●■■■■■■■||    |■■■■■■■4
     6■■■■■■■||    |■■■■■■■●-2-●
640 GOSUB7040
650 PRINTZ$;"DO YOU WANT TO START?";
660 GETA$:IFA$="N"THEN2000
670 X=RND(1):IFA$<>"Y"THEN660
1000 REM HUMAN MOVE
1010 G=0:SB=0
1020 PRINTZ$;"WHICH BOX ? ";
1030 GETA$:IFA$=""THEN1030
1040 N=ASC(A$)-65
1050 IFN<0ORN>24THEN1030
1060 R=INT(N/5):N=N+9+2*R
1070 IFB%(N)<64THEN1100
1080 PRINTZ$;"THAT BOX IS TAKEN
1090 GOSUB5000:GOTO1020
1100 PRINTA$,"WHICH SIDE ? ";
1110 GETB$:IFB$=""THEN1110
1120 S=ASC(B$)-48:IFSAND1THEN1110
1130 IFS<2ORS>8THEN1110
1140 PRINTS
1170 IF(B%(N)ANDC(S))=0THEN1220
1180 PRINTZ$;"THAT SIDE IS TAKEN
1190 GOSUB5000
1200 PRINTZ$;"WHICH SIDE OF BOX ";
1210 PRINTA$;" ?";:GOTO1110
1220 GOSUB6000:PRINTM$+C$(S)
1230 GOSUB3000
1240 N=N+C(S+1):S=10-S
1250 IFB%(N)>64THEN1270
1260 GOSUB3000
1270 IFSBTHEN1000
2000 REM PET MOVE
2010 G=1:SB=0
2020 GOSUB4000:R=INT(N/7)-1
2140 PRINTZ$;"I WILL PLAY BOX ";
2150 PRINTCHR$(N+56-2*R),
2160 PRINT"SIDE";S
2170 GOSUB6000:PRINTM$+C$(S)
```

```
2180 GOSUB5000:GOSUB3000
2230 N=N+C(S+1):S=10-S
2240 IFB%(N)<65THENGOSUB3000
2250 IFSBTHEN2000
2260 GOTO1000
3000 REM UPDATE STATUS
3005 X=C(S)
3010 ONFNA(N)GOTO3050,3300,3400
3020 B%(N)=B%(N)+16+X
3030 IFB%(N)>64THENGOSUB7000
3040 RETURN
3050 REM CHAIN
3060 SH=0:I=0
3070 K=2↑I:IF(B%(N)ANDK)OR(K=X)THEN3250
3080 B=N+C(2*I+3)
3090 IFFNA(B)<>2THEN3230
3100 FORJ=1TOLC:L=L%(J,0)
3110 FORU=1TOL:IFL%(J,U)<>BTHEN3220
3120 IFJ=SHTHEN3020
3130 IFSHTHEN3160
3140 L%(J,L+1)=N:L%(J,0)=L+1
3150 SH=J:GOTO3250
3160 FORV=1TOL%(SH,0)
3170 L%(J,L+V)=L%(SH,V):NEXTV
3180 L%(J,0)=L+L%(SH,0)
3190 FORV=0TOL%(LC,0)
3200 L%(SH,V)=L%(LC,V):NEXTV
3210 LC=LC-1:GOTO3020
3220 NEXTU,J
3230 IFSHTHEN3020
3240 LC=LC+1:L%(LC,1)=N:L%(LC,0)=1:SH=LC
3250 I=I+1:IFI<4THEN3070
3260 GOTO3020
3300 REM SAVE AS CAPTURE
3310 C=C+1:T%(C)=N:GOTO3020
3400 REM CAPTURE
3410 FORJ=1TOLC:L=L%(J,0)
3420 FORU=1TOL:IFL%(J,U)=NTHEN3440
3430 NEXTU,J
3440 FORI=1TOC:IFT%(I)=NTHEN3460
3450 NEXTI
3460 T%(I)=T%(C):C=C-1
3470 IFL=1THENSH=J:GOTO3190
3480 L%(J,U)=L%(J,L):L%(J,0)=L-1
3490 GOTO3020
4000 REM SMART MOVES
4010 IFC=0THEN4060
4020 FORJ=1TOC:N=T%(J)
4030 GOSUB4900
4040 IFFNA(N+C(2*I+3))>2THEN4870
4050 NEXTJ
4060 V=0:FORI=1TOLC
4070 V=V+L%(I,0):NEXT
4080 IFA>VTHEN4650
4090 REM 3RD PHASE
4100 IFC=0THEN4770
4110 IFLC=1THENN=T%(1):GOTO4860
4120 FORI=1TOLC:L=L%(I,0)
4130 E%(I)=0:FORJ=1TOL
4140 IFFNA(L%(I,J))=2THEN4170
4150 IF(L=3)OR(L>4)THENN=L%(I,J):GOTO4860
4160 E%(I)=E%(I)+1
4170 NEXTJ,I
4180 S=0:FORJ=1TOLC
4190 IFE%(J)=0THEN4330
4200 IF(L%(J,0)=4)AND(E%(J)=1)THEN4600
4210 IFL%(J,0)=2THEN4320
4220 P=0:FORK=1TO4
4230 IFB%(L%(J,K))<48THEN4260
4240 IFP=0THENP=L%(J,K)
4250 Q=L%(J,K)
4260 NEXTK
4270 N=P:GOSUB4900:P=P+C(2*I+3)
4280 N=Q:GOSUB4900:Q=Q+C(2*I+3)
4290 FORI=0TO3:IF(B%(Q)AND(2↑I))THEN4310
4300 IFP=Q+C(2*I+3)THEN4320
4310 NEXT:GOTO4600
4320 S=S+1:X=J:IFS=2THEN4600
4330 NEXTJ
4340 S=0:FORJ=1TOLC
4350 IFX=JTHEN4370
4360 IFL%(J,0)<3THENS=S+1
4370 NEXT:J=X
4380 IF(SAND1)THEN4600
4390 REM SACRIFICE
4400 FORI=1TOL%(J,0):N=L%(J,I)
4410 IFFNA(N)=2THEN4430
4420 NEXT
4430 FORI=0TO3:K=2↑I
4440 IF(B%(N)ANDK)THEN4460
4450 IFFNA(N+C(2*I+3))<>3THEN4870
4460 NEXT
4600 REM CAPTURE IN CHAIN J
4610 FORK=1TOL%(J,0)
4620 IFB%(L%(J,K))>48THENN=L%(J,K):GOTO4860
4630 NEXTK
4650 REM 1ST PHASE
4660 X=65:IFCTHENN=T%(1):GOTO4860
4670 N=INT(9+33*RND(1)):Q=N
4680 IFFNA(N)>1THEN4740
4690 FORI=0TO3:K=2↑I
4700 IF(B%(N)ANDK)THEN4730
4710 B=N+C(2*I+3):IFB%(B)=XTHEN4730
4720 IFFNA(B)<>2THEN4870
4730 NEXT
4740 N=N+1:IFN=42THENN=9
4750 IFN<>QTHEN4680
4760 IFX=65THENX=-1:GOTO4670
4770 REM MUST GIVE AWAY
4780 M=99:FORI=1TOLC
4790 IFL%(I,0)<MTHENM=L%(I,0):N=L%(I,1)
4800 NEXT:IFM=1THEN4860
4810 FORI=0TO3:K=2↑I
4820 IF(B%(N)ANDK)THEN4840
4830 IFFNA(N+C(2*I+3))=2THEN4870
4840 NEXT
4850 REM FIND SIDE
4860 GOSUB4900
4870 S=2*I+2:RETURN
4900 FORI=0TO3:K=2↑I
4910 IF(B%(N)ANDK)THENNEXTI
4920 RETURN
5000 REM DELAY
5010 FORD=1TO2000:NEXT:RETURN
6000 REM GRAPHICS
6010 M$="▒"+LEFT$(D$,4+4*R)
6020 M$=M$+LEFT$(R$,4+4*(N-9-7*R))
6030 RETURN
7000 REM FILL IN
7010 S$="▒    ▒███ "+C$(G)+" ▒███    ▀"
7020 C(G)=C(G)+1:R=INT(N/7)-1:SB=1
7030 GOSUB6000:PRINTM$+S$
7040 PRINT"▒▒▒▒▒▒▒▒▒▒"
7050 PRINTSPC(29)"▒";C(0)
7060 PRINT"▒▒";SPC(35);C(1)
7070 A=25-C(0)-C(1)
7080 IFATHENRETURN
7090 PRINTZ$;"▒ GAME OVER ":GOSUB5000
7100 PRINT"▒▒▒▒▒":IFC(1)>17THEN7180
7110 IFC(1)>12THEN7160
7120 IFC(1)>7THEN7140
7130 PRINT"I SURRENDER !!":END
7140 PRINT"YOU WIN-BUT IT WAS CLOSE
7150 GOTO7200
7160 PRINT"I WIN ! HARD LUCK,";N$
7170 GOTO7200
7180 PRINT"YOU WERE HAMMERED,";N$
7190 PRINT"▒TAKE UP CHESS-IT'S EASIER
7200 PRINT"▒▒PLAY AGAIN?
7210 GETA$:IFA$="N"THENEND
7220 IFA$<>"Y"THEN7210
7230 GOTO170
8000 REM RULES
8010 PRINT"▒  DOTS AND BOXES-RULES▒▒
8020 PRINT"1 WE TAKE IT IN TURNS TO";
8030 PRINT" COMPLETE ONE     SIDE O";
8040 PRINT"F A BOX▒▒
8050 PRINT"2 IF YOU COMPLETE THE 4TH";
8060 PRINT" SIDE OF A BOX   YOU WIN ";
8070 PRINT"THAT BOX AND MUST PLAY AG";
8080 PRINT"AIN▒▒
8090 PRINT"3 THE WINNER HAS THE MOST";
8100 PRINT" BOXES AT THE    END OF T";
8110 PRINT"HE GAME▒▒
8120 PRINT"4 TO PLAY, USE A-Y TO PIC";
8130 PRINT"K THE BOX THEN   2,4,6,8 ";
8140 PRINT"AS INDICATED FOR THE SIDE
8150 GOTO170
9000 DATA"▒▒▒───",1,7,"▌▌|▒▌▌|▒▌▌|",2,-1
9010 DATA"▒▒▌▌|▒▌▌|▒▌▌|",4,1,"▒───",8,-7
9020 DATA1,2,3,4,5,6,7,8,14,15,21,22
9030 DATA28,29,35,36,42,43,44,45,46
9040 DATA47,48,49
```

PROGRAMMERS

Wanted: Free-lance programmers familiar with TRS-80 Level II BASIC to write customized software packages for dynamic electronics retailer.

If you are a University student, tutor, lecturer, doctor, lawyer, computer programmer or microcomputer buff and if you own a TRS-80/SYSTEM 80 and/or enjoy programming in BASIC, why not take this opportunity to make some extra money in your leisure time by writing various software programmes for us?

Give me a call – you have nothing to lose but plenty to gain.

Please apply in writing to:

MARK SIM
DICK SMITH
ELECTRONICS
Cnr. Lane Cove Road & Waterloo Road,
North Ryde, NSW 2113.

Next Month

BENCHTEST 1
The early SuperBrain adverts seemed too good to be true – then subsequent delays in its reaching the market place sparked off rumours of trouble.
Sue Eisenbach investigates.

PRINTERS
There are over a hundred printer manufacturers in the world today and the wide range of facilities they offer frequently cause a great deal of confusion. Next month's exhaustive review sets out to explain how the various types of printer work and what options they offer; an easy-to-understand reference chart has been included to help you choose the printer most suited to your requirements.

PERSONAL OPINION
Lecturer Bob Pascoe mounts his monthly soapbox to provide a running commentary of the Australian micro scene.

BASIC BASIC
Mike Parr suggests a way of presenting programs so that they can be easily implemented by users of any machine.

BENCHTEST 2
The one you've been waiting for – CBM's 'SuperPET'. The 80 – column CBM Model 8032 is put through its paces by Peter Calver and David Tebbutt.

MICROCHESS
Our resident micro chess expert Kevin O'Connell reports on an interesting chess contest with a difference – it's one that's being fought out in the law courts.

GATEWAYS TO LOGIC
Chapter 3: How computers think.

FACE TO FACE
Free-format dialogues and the man/machine interface.

PLUS REGULAR FEATURES
Newsprint, Yankie Doodles, Computer Answers, Newcomers Start Here, Users Group Index, Leisure Lines, In Store, Programs, Communication and another Sinclair ZX80 competition.

ADVERTISERS INDEX

ASP Microcomputers	21
Abacus Computer Store	12
Anderson Digital Equipment	4, 29
Antelope Engineering	40
BS Microcomp	42
C.I.S.A	36
Computerland	IFC, IBC, 2
Computerware	14
Computer Company	7
Computer Country	40
Deforest Software	Insert
Dick Smith Electronics	53, 55
Electromedical Engineering	24
Informative Systems	44
Logic Shop	24
Looky Video	44
MS Microsoftware	26
McGills Authorized Newsagency	42
MicroPro Design	18
micro Educational	46
Seahorse Software	42
Sigma International	11
Sinclair Equipment (Australasia)	50, 51
System Software	5
TCG Ohio Scientific	OBC

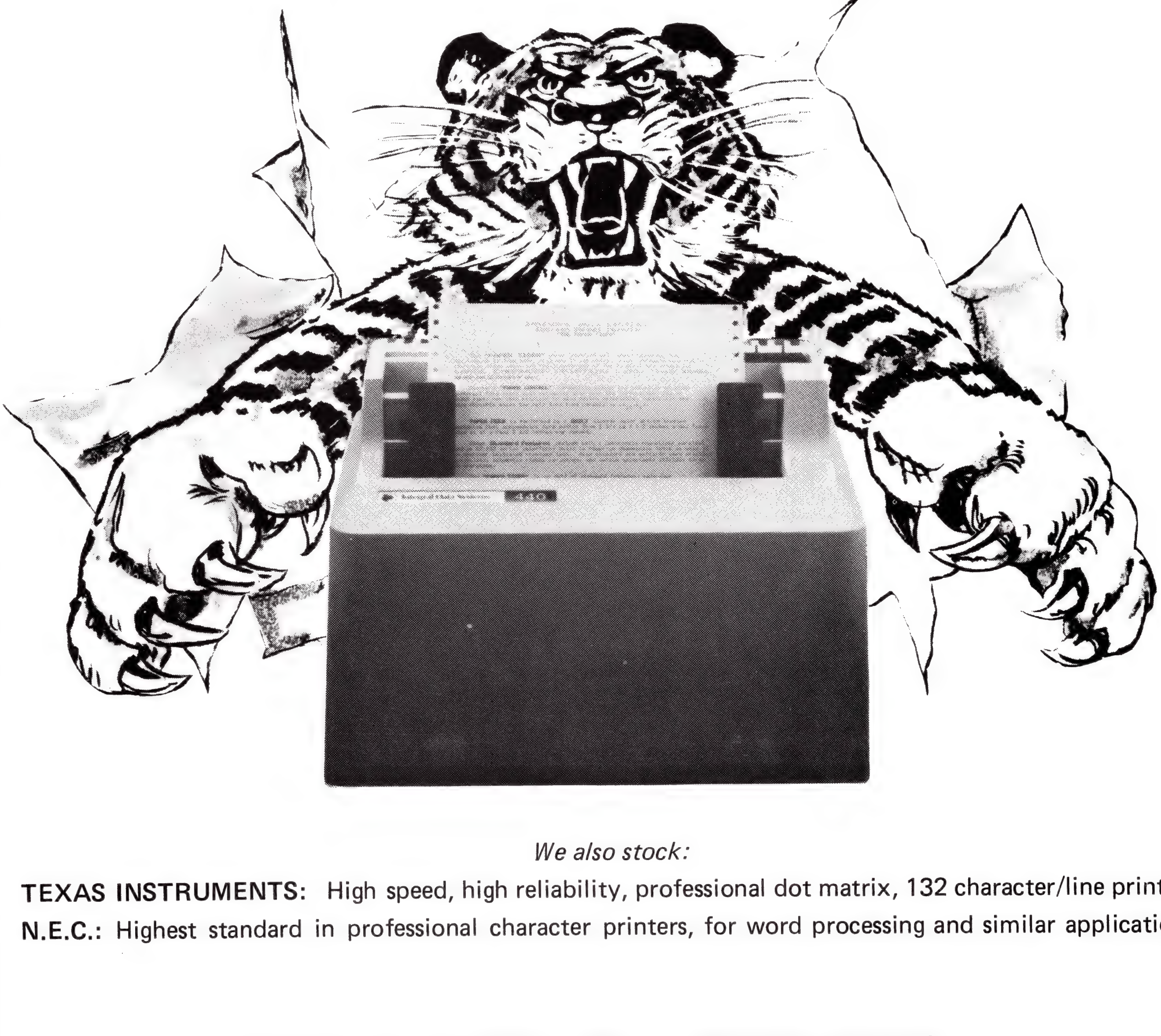
The Paper Tiger IDS440 Impact Printer

Puts more bite into everything you do.

Now available — the Paper Tiger Printer features a graphics option that lets you make the most of your Apple II or other personal computer. And, the Paper Tiger gives you 8 software-selectable character sizes, 80 and 132 column formats, Multi-Part business forms handling, adjustable tractor feed, form control, reliable stepper motor paper drive, serial and parallel interfacing . . . plus lots more.

Don't let our low prices fool you!

The Paper Tiger is rugged enough to stand up to the most demanding printer/plotter requirements.



We also stock:

TEXAS INSTRUMENTS: High speed, high reliability, professional dot matrix, 132 character/line printers.

N.E.C.: Highest standard in professional character printers, for word processing and similar applications.

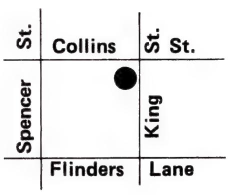
— AUSTRALIA'S LEADERS IN SMALL COMPUTER SYSTEMS —

write now or call us:

ComputerLand®

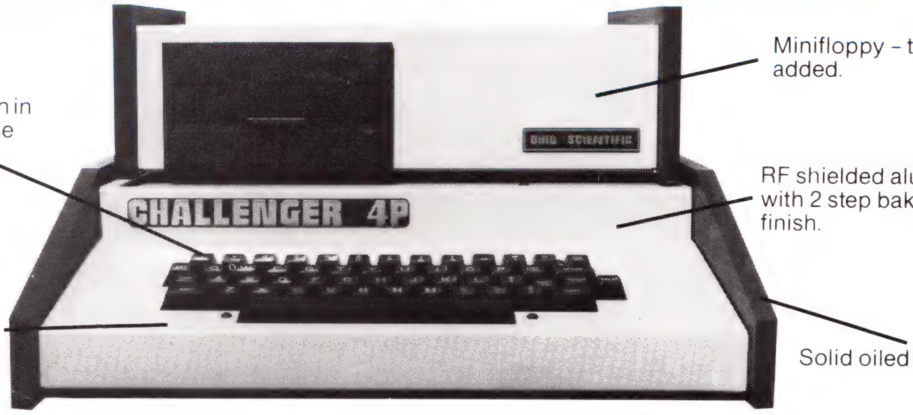
in Melbourne

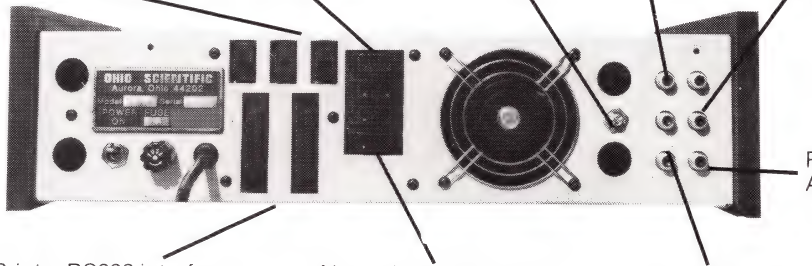
Grd. Floor, 555 Collins Street, MELBOURNE. VIC. 3000.
Phone (03) 62 6737 (03) 62 5581 Telex AA37007.



The Challenger 4

Whichever way you look at it, no other computer offers so much for so little, and in colour!


Full 53 key, keyboard which in polled mode can recognise up to 8 simultaneously depressed keys.
Minifloppy – two can be added.
RF shielded aluminium case with 2 step baked on enamel finish.
Inside: real time clock and countdown timer 24K memory 6502A processor
Solid oiled walnut sides.
CHALLENGER 4P
OHIO SCIENTIFIC


Control line interfaces, parallel lines for home security, accessory BUS, parallel I/0 lines or other TTL signals.
Joystick sockets – add realism to games.
Colour adjustment.
Video Display 64 × 32
Sound outputs, programmable tone generators – 8 bit companding digital to analog convertors.
RF output for control of AC appliances.
Printer RS232 interface
Numeric key pad slots.
Cassette sockets.
OHIO SCIENTIFIC Aurora, Ohio 44202

You'd have to go a long way to get better value in a computer. It has execution speed that really separates the computers from the toys. We think the Challenger 4 is way ahead of anything you've seen so far, for a wide variety of uses including business, personal, educational and games, as well as a real-time operating system, word processor and a data base management system.

The Challenger 4 has a 2MHz 6502 processor, and if that's not fast enough we can supply the GT option with the 6502C processor, and 120 nanosecond memory which averages over one million instructions per second.

A real time clock and count down timer, a 64 x 32 display in 16 colours, including 8K memory in the cassette version, 24K for the minifloppy. A BUS structure allows easy plug in of extra memory or many more OHIO boards. The BUS means modularity. If you bought your vintage C2-4 in 1977 we can change the boards at a much lower cost than a new computer.

For the best surprise of all ask our opposition if they can provide all these facilities. When they can't, ask us!

Special offer with this advertisement only — bring it along with you when you visit your dealer and obtain $20 discount off your CHALLENGER 4 purchase.

TCG
TOMORROWS TECHNOLOGY TODAY
OHIO SCIENTIFIC

LOCKWOOD TCG 4628

For more information and advice call on your local dealer to help you select the best system for your needs

AUSTRALIAN DISTRIBUTOR-TCG,
31 Hume St., Crows Nest, N.S.W. 2065

AUTHORISED AUSTRALIAN AGENTS

NEW SOUTH WALES

Bambach Elect. NEWCASTLE 2-4996
Compuserve Newcastle Pty. Ltd.
HAMILTON 61 2579
Dwell Electronics HORNSBY 487 3111
Hi-Fi Gallery TAMWORTH 66 2525
Macelec WOLLONGONG 29 1455
Micro Visions KINGSFORD 662 4063
Shoalhaven Communications
NOWRA (044) 24 444
J.G. Pearce Systems
DOVER HEIGHTS 789 4300
Unique Electronics
MERRYLANDS 682 3325

AUSTRALIAN CAPITAL TERRITORY
MES CANBERRA 82 1774

QUEENSLAND
Dialog BRISBANE 221 4898

SOUTH AUSTRALIA
Applied Data Control
FULLARTON 79 9211
K Tronics ADELAIDE 212 5505

TASMANIA
Eastside Computers
EAST DEVENPORT 27 8121
J. Walsh & Co. HOBART 34 7511

VICTORIA
Ellison Hawker Education Pty. Ltd.
HAMPTON 598 9141

WESTERN AUSTRALIA
Datas Comp. Acc. PERTH 381 364
Micro Data EAST PERTH 328 117
Micro Solutions SUBIACO 381 837

AUSTRALIAN
Personal
Computer

THE SUPERPET BENCHTESTED

AUSTRALIA'S LEADING MICRO MAGAZINE

ISSUE No. 6

$1.95

HACKING THROUGH THE PRINTER JUNGLE
A 'Jane's Guide' to all the options

¼ million people made their first computer purchase from us.

We are ComputerLand, the number one retailer of small computers in the world.

Why did so many people join the ComputerLand team? Because, like you, they wanted to buy their first computer from a specialist; from someone who cared about their satisfaction.

We at ComputerLand carry the widest selection of small computer equipment available in Australia.

Micro•computers, printers, V.D.U.'s, synthesisers and software, all at price you can afford too.

Our courteous sales and service staf can configure a computer system t your specifications, and in many cas deliver it to you that same day.

So, don't limit your options. Come t ComputerLand today and join the number one team. We're expandin the way your world thinks.

Adelaide — 131 PIRIE STREET PHONE 223 5083
Brisbane — 127 CREEK STREET PHONE 221 9777
Melbourne — 555 COLLINS STREET PHONE 62 5581
Perth — 197 ST. GEORGES TERRACE PHONE 321 4671
Sydney — 55 CLARENCE STREET PHONE 29 3753

ComputerLan

© CLA Sydney July 1980

CONTENTS

Volume 1. No. 6 November 1980

3 NEWSPRINT Miriam Cosic reports in her unique style.

9 YANKEE DOODLES A report on Tandy's three new machines.

14 BENCHTEST 1 The 80-column CBM Model 8032 'SuperPET' is put through its paces by Peter Calver and David Tebbutt.

19 MICROCHESS Our resident expert, Kevin O'Connell, reports.

20 BASIC BASIC Portable programming by Mike Parr.

22 PERSONAL OPINION Bob Pascoe inaugurates his column.

23 SAVE US ! APC's reply to the DIY Atomic Bomb.

26 PRINTERS Our bumper review of printers, compiled by Mike Dennis.

38 COMPUTER ANSWERS Sheridan Williams and his team answer your queries.

39 BENCHTEST 2 Does the SuperBrain live up to its ads? Sue Eisenbach reports.

46 Newcomers Start Here. Our quick intro to the world of microcomputing

47 READER SURVEY It's over to you!

50 IN STORE APC's updated buyers' guide.

52 COMMUNICATION Our readers in their own write.

54 LEISURE LINES More "brainstorms" from J.J. Clessa.

54 PROGRAMS Get those fingers tapping on our readers' latest listings.

59 BLUDNERS Where we climb onto our penitent's stool.

Australian Editor
Sean Howard
Editor
David Tebbutt
Deputy Editor
Peter Rodwell
Executive Editor
Bruce Sawford
Advertisement Manager
Marie Pirotta
Advertisement Assistant
Josephine McKenna
Production Manager
Michael Thomas
Typesetting
Pam Typesetting
Jane Hamnell
Printed by
Mercedes Printing Co.
London Editorial Office:
Sportscene Publishers (PCW) Ltd.,
14 Rathbone Place,
London, W1P 1DE,
Tel: 01-637 7991/2/3
Telex: 8954139 A/B 'Bunch' G.
London
London Advertisement Manager
Stephen England
(01-631 1786)
Consultants
John Coll, Mike Dennis, Miriam Cosic, Michael James, David Hebditch, Sheridan Williams, Dr Adrian Stokes, Dr Stephen Castell.

Published by *Australian Microcomputer Journal*
P.O. Box 115, Carlton,
Victoria, 3053.
Telephone: (03) 82 5783.
Telex: AA30333.
P.O. Box 250,
North Sydney, N.S.W. 2060.

Produced in Australia
under licence from *Felden Productions Ltd.*, England.

Subscription Rates:
Australia $24.00 for 12 issues, New Zealand $30.00 for 12 issues (surface mail). Prices include postage and packing. Supplies to specialist shops can be arranged by negotiation direct with the publishers.

Cover Illustration
Philip Carter — with a tip of the hat to the late Edgar Rice Burroughs.

Distributed by
Gordon & Gotch (A'asia) Ltd.,
MELBOURNE, SYDNEY.

Copyright Notice
All material contained within *Australian Personal Computer* is protected by the Commonwealth Copyright Act 1968. No material may be reproduced in part or whole without written consent from the copyright holders.

APC welcomes all unsolicited material (written, photographic & illustrative) and, although no guarantee can be given as to its safe return, reasonable care and attention will be exercised.

Guidelines for Contributors

APC welcomes articles of interest. Don't be put off if your style of writing is "under developed" . . . true worth lies in the content, and shaping features comes naturally to us! Manuscripts should not exceed 3,000 words and authors are asked to use triple spaced lines with a wide left-hand margin; diagrams, listings and/or photographs should be included wherever possible. Please enclose a stamped, self-addressed envelope if you would like your article returned.

Because of the foregoing, it is necessary to add that the views expressed in articles we publish are not necessarily those of *Australian Personal Computer*. Overall, however, the magazine will try to represent a balanced, though independent viewpoint. Finally, before submitting an article, please check it through thoroughly for legibility and accuracy.

EDITORIAL

We're a fairly self-effacing lot down here at APC, but there are some things you just can't help bragging about. Since we started in May, our readership figures have been rising steadily. But this month they've stopped rising steadily. Instead, they've taken a hefty leap and our distributors have asked us to double the number of copies printed, and immediately.

This month's Sinclair ZX80 competition is designed to motivate you to write in about your opinions, instead of just vaguely muttering to yourself. We're obviously doing something right, but we want to know exactly what you like and what you hate.

Yet again we're calling for programs, especially routines and bits of information about various computers. Our readership must be pretty literal minded because we've received lots of programs for the more exotic computers but those for the more common type have been falling off. In saying we want more of one kind we don't want everyone else to get all hurt and go quiet on us. So this time, how about some more programs for the garden variety type of computer!

archives

the price breakthrough in performance business computers.

Success in today's business world demands efficiency and financial accuracy. But the ever -increasing cost and comlexities of doing business are forcing you to find new ways to cut labour cost as well as gain tighter control over your business.

The ARCHIVES BUSINESS COMPUTER can give you the control you need to be successful, all in one economical desk-top cabinet.

The ARCHIVES BUSINESS COMPUTER can do your daily business functions such as accounts receivables and payables, general ledger and inventory control. It can keep track of stock on hand, stock on order, and supplies to be ordered. As a Word Processor the ARCHIVES BUSINESS COMPUTER can do your correspondence, text editing of manuals, contracts and proposals. The ARCHIVES BUSINESS COMPUTER can do virtually any information handling or record keeping operation you are presently doing plus many desirable operations that cannot economically be performed by manual methods.

The Archives disk storage can reduce entire filing cabinets to convenient 5¼ inch disks and instantly retrieve any information that you may need when you need it.

Sound incredible? The ARCHIVES BUSNESS COMPUTER is that and more!

It's a business assistant. One that never forgets, never loses reports, makes efficient use of its time and is completely trustworthy.

The ARCHIVES BUSINESS COMPUTER is also easy to work with. So easy in fact, it's no more difficult to operate than any other office machine. While the ARCHIVES BUSINESS COMPUTER is handling the extra work load, you can have more time to develop new business in the field.

There is no question that the major area restricting your business growth is in the office. This is one place where employee efficiency is still in the dark ages -requiring the handling of paper, forms and files. What you really need is not the physical presence of obsolete forms and letters, but the information and data they contain. You need the Archives Business Computer.

The Archives Business Computer offers you an economical way to individualised computing power. You can take it anywhere there's work to be done. Plug it in, turn it on, and it's working for you giving you instant access to the information you need.

Designed especially for a small business or single department in a large corporation, the Archives Business Computer is a system you can understand and use with a high degree of efficiency without being a computer specialist.

Incorporating quality and reliability the Archives Business Computer provides you with today's and tomorrow's best value in a computer system. The Archives Business Computer is a system to help your business grow.

The Archives Business Computer is backed by competent and qualified technical support for both equipment maintenance and software aid as well as continuing personalised service.

One of the best investments you can make in this inflationary economy is the Archives Business Computer. In fact, virtually every business enterprise can benefit in some practical way from business computing.

A full scale demonstration of the Archives Business Computer will help you draw positive conclusions about how your business can improve its cash flow, reduce costs and risks, improve customer service, increase sales, and improve your employee productivity.

It's time to make a move for the future.
It's time to contact Computerland
Melbourne your Archives dealer.

FEATURES
Z80 4MHz Processor
64 K RAM Standard
744K Bytes Storage (Standard)
1½ Megabytes Storage (Optional)
12" Green Phosphor Monitor
25 Lines x 80 Display
CP/M Operating System
Selectric Style Keyboard
S100 Expansion Inbuilt
Microprocessor Keyboard
240 x 100 Graphics Format
Numeric Keypad and Function Keys.

SOFTWARE
Microsoft Fortran
Microsoft Basic
Microsoft Cobol
General Ledger
Stock Control
Mail List
CBasic 2
Accounts Payable
Accounts Receivable
Property Management
Word Processing System
Microsoft Basic Compiler

ComputerLand®
in Melbourne
555 Collins St. •Melbourne, Vic. •Australia 3000 Phone 62 5581 •62 6737 •Telex AA37007

archives

NEWSPRINT

Miriam Cosic and associates present the latest world-wide micro news.

OURS is not to wonder why

The Sharp MZ80K has been out for a year but it isn't being sold in Australia or, for that matter, the US. Our queries to Sharp have been met with rock-like silence. But I've unearthed some background information which may shed enough light on the matter for us all to realize that we don't know what's going on.

Tandy sells a hand held computer which is actually made by Sharp. Sharp sells the same computer under its own name as the PC-1211, but not in Australia. Presumably this is because Tandy sells theirs here. Yet, in England, Sharp markets the PC-1211 alongside Tandy's computer (and for less!)

Still with me? Right. Another piece of information of dubious relevance is that the Z80 microprocessor in Sharp's MZ80K is made in Japan by Sharp, under licence to Zilog who don't want products using the Z80 sold in America. Which explains why the MZ80K isn't being sold in the US but not why it isn't being sold here.

Tandy doesn't sell a MZ80K clone here, so the Tandy-Sharp connection also doesn't shed light on what's happening.

Interesting? Confused? So am I.

And on the subject of Sharp, rumour has it that a printer will be available "soon" for the PC-1211. Presumably, this means that Tandy will have a new release "soon".

Calculator news

Following in Sharp's footsteps, National Panasonic has announced a pocket computer, using Basic, and of similar layout to the Sharp PC-1211.

Unlike Sharp, however, it appears that Panasonic intends to launch the RL-H1000 as a system, with plug-in modules for both ROM and RAM expansion, video interface, acoustic coupler and a printer. The machine should be available this autumn in the USA, but no decision has been taken on Australian sale and no prices are available.

Another contender in the pocket computer stakes is the Nixdorf LK-3000. This machine started life as a translator under the name of Lexicon. Nixdorf is now offering the machine with modules other than translation modules. Those which may interest readers of this column are a calculator module, a "filing system" and an "electronic notepad" or "personal program" module, comprising 1k of CMOS RAM with its own processor and operating system enabling the storage and retrieval of names files. In addition, an acoustic coupler and RS232C interface are available to allow the machine to be used as a portable terminal. The modules available, except for the "personal program", are all in ROM, and it does not appear at present that any facility exists for user written programs.

Dick Pountain

Refreshing memories

Memory chips that can refresh their own memories are just starting to appear – Celdis has announced the new Mostek 4816 chip with 2 kbytes of read and write memory – and they are so obviously useful that it seems a mystery as to why it wasn't done before. The answer is that a memory which needs refreshing can do its own refreshing – but needs to know when to do it.

Refreshing is a very simple process: it involves recharging static electricity charges in memory cells. The circuitry takes care of the problem of deciding whether there was or was not a charge in the cell to start with by reading the cell first. Unfortunately, there is a computer in most memory systems, busily reading the memory cells too. Refresh and computer reads have to be done separately, or things get very confused. The trouble is that different micros do their memory reading at different stages in the instruction cycle. A memory designer looks at the clock cycle of the processor, and arranges for refreshments when the memory is off duty. Put another processor into the system, and it will find the memory enjoying light refreshments when there's hard work to be done.

The Mostek 4816 gives the decision (when to refresh) to the system designer. But it is much easier than normal: you just tell the chip 'refresh', and it does it. In the future, the circuitry on the memory chip that bustles around refreshing each cell, will become even brighter. Next year, Motorola promises to have a 64K bit memory chip which can study the clock cycles of the micro used and deduce from the pattern of pulses what microprocessor it is – and refresh itself accordingly.

Guy Kewney

Kiss of death

I'm really enthusiastic about the Acorn Atom. But it's bringing as much bad luck to people dealing with it in this industry as the curse of the mummy did to people in the archaeology industry.

First Cottage Computers went broke while waiting for delivery way past its publicised August release date.

Then Consolidated Marketing managed to get their hands on an Atom and displayed it at the Melbourne computer exhibition, pending the January release (was that January 1981?) Come Friday, sometime after the six o'clock closing time, and the Atom went walkabout. A little Sinclair kept it company, and although that would fit in a pocket, how they got the Atom out the door is nobody's business. Or rather it should have been somebody's business.

Attention

I originally used that headline to vent my spleen on the Editor's misplaced sense of urgency. In line with editorial practice world wide, he's now coopted my idea, together with another idea of mine to get "his" brilliant new plan announced.

So. APC is starting an advertising section for professional or budding programmers to flog their own software without recourse to selling their brainchildren to the big companies. Instead of putting your baby into the byte slave trade you can advertise it with us, reach thousands of readers and retain control over your product.

We've published a pamphlet which will be forwarded to you if you need advice on how to go about it. (Just send an S.A.E. to the Editor). Even if it doesn't make you a millionaire overnight, it's a good excuse to register a business name, which always impresses friends.

A "real computer in Kit form", the Compukit 101 is based on the powerful 6502 microprocessor, comes with 8K Microsoft BASIC in ROM and is expandable to 8K RAM on board. It plugs into a domestic TV, and for $595 you get PC board, parts, construction manual, ROM and RAM. From Melbourne House (Aust.) Pty. Ltd. in Collingwood).

COMMODORE AND MICROPRO DESIGN JOIN FORCES!

CBM 3032

MicroPro Design is now available to offer the Commodore microcomputer system at prices you can afford! We specialise in the design and manufacture of custom microcomputer equipment and have turned our efforts to the CBM and PET.

Besides having the full range of standard Commodore products available, we can offer interfaces to allow virtually any piece of equipment to be connected to the CBM through the IEEE 488 bus.

You can now also use our MicroCon general purpose microcomputer as a slave to the CBM. This allows you to connect A/D, D/A convertors, digital inputs and digital outputs for industrial control, monitoring and data aquisition. Programmes for the MicroCon can be created in the CBM and loaded down the IEEE 488 bus into the MicroCon for execution.

A few of the current devices now available for use with CBM and PET

IEEE 488 – RS232 INTERFACE	$ 350.00
IEEE 488 – CENTRONICS INTERFACE	$ 250.00
IEEE 488 – DIABLO (RICOH, QUME)	$ 420.00
IEEE 488 – MICROCON INTERFACE	$ 200.00
CITOH PRINTER (80 COL. 125 CPS)	$ 970.00
DIABLO W.P. PRINTER (WITH INTERFACE)	$3500.00

Above prices include all cables and connectors where applicable but do not include sales tax. (Dealer enquiries invited).

Write or call for all prices on the Commodore equipment.

SPECIALISTS IN THE DESIGN AND MANUFACTURE OF MICROPROCESSOR BASED EQUIPMENT

MicroPro Design Pty. Ltd.

P.O. BOX 153, NORTH SYDNEY, NEW SOUTH WALES, 2060, AUSTRALIA.
SUITE 205, WENTWORTH HOUSE, 6–8 CLARKE ST., CROWS NEST, NSW, 2065. PHONE: (02) 438 1220.

NEWSPRINT

Chess can be played by the Texas Instruments 99/4 home computer. The graphics are beautiful and the amazing David Levy was a major consultant in the design, so it must have something going for it. The point that will ensure that it really takes off is the four levels of playing skill. On the announcement of the chess package, it was said that the chess game plays in three styles — normal, aggressive, or passive. On the version I saw demonstrated, it also offered a fourth. It plays a strategy called "losing", at its beginner level. Irresistable, but I still didn't manage to beat it.

COBOL in miniature

MICROCOBOL is now available on National Panasonic desktop micros. It incorporates all the major facilities in mainframe ANS COBOL as well as simplifying interactive development with features such as formatted displays and structured programming. The benefits of having a business oriented language like Cobol, with its high-powered data structuring capabilities, available for use on micros is obvious.

The novice to computers is catered for with Autoclerk and Autoindex. The former allows the beginner to easily create and modify data file and generate reports. The latter is a simple to use on-line enquiry and data base management system.

Information from the Computer Company, 4 Cliff St, Milsons Point, 2061; Tel.: (02) 436 1733. There are representatives in all other state capitals.

Just cruising

Zemco has a new cruising aid for around $88. No, Mr. Howard, I'm not trying to corrupt the morals of our youth. It's for the car and controls speeds, acceleration, gear changing and such.
It has an overtake function where the accelerator overrides cruise control, and I assume the brake will also override when you're heading for a semitrailer.

The company claims fuel saving, less chance of accident or of being booked for speeding, no more cramped right legs or driving with the left foot on the accelerator during long trips.

Personally I'd rather a cramped leg than an atrophied brain. But as few people are as reactionary as I am, such controls are coming things; and Zemco's slogan, "There's no place for second best", together with their claim to have put some other poor beggar out of business because their product is better and cheaper, makes their product worth looking at.

Other products on the way include an ultrasonic car alarm (you can take your German Shephard off shift work), and an on-board computer.

Zemco are at 68 Alfred Street South, Milson's Point, NSW 2061; Tel: (02) 929 4033.

Neat ensemble

An American designer has come up with a new system which shows some concern for the human who will use it – by concentrating on the display technology. Mark Underwood, product development manager of a San Diego firm called Integrated Research and Information Systems (Iris, or Irisystems), had noticed the strange fact that most microsystems might be either TV screens, or black boxes.

"The display subsystem of today's microcomputers is very important to users, yet tends to be overlooked by designers. We have tried to package a system which accommodates the different needs that users express," he says. The result is a product called Ensemble 120GX, for which most of the product announcement talks about pixels – points of light on a display screen, and normally mentioned only in describing the matrix of the dots used in generating screen characters.

The standard Ensemble is not el cheapo – but then the list of contents of what "might be easily mistaken for a terminal" is impressive. For your $9796, you get a Pascal Microengine – a powerful 16-bit processor that runs instructions written in P-code rather than clumsy machine code – plus high resolution graphics, plus a video screen, plus a 12-slot box of S100 standard (ie cheap) cards for adding memory, special features and so on. There is a keyboard too, plus a 'big' floppy, plus 128 kbytes of memory, and an alternative Z80 processor to let you run CP/M and all the pre-written applications that come with this operating system. A cheaper version, at $3464, offers only the Z80, one mini disk and a much smaller screen.

Underwood is proudest of the pixel count of the Ensemble: "We believe that the greatest need is for higher resolution black and white graphics. The Ensemble can present a 768 by 480 pixel format, in 8 by 16 pixel characters, some of which can be user-designed." Apparently it can handle colour too. Details on (714) 457 3730, or from 10150 Sorrento Valley Road, Suite 320, San Diego, Ca 92121.

Guy Kewney.

ROM upgrade

The 8K Basic ROM for the Sinclair ZX80 was unveiled in London in the early weeks of September. We colonial cousins shouldn't have to wait more than several weeks for it.

For under $75.00, it will add several important capabilities to the machine. It will allow floating point, logs and trigonometrical functions, animated displays, string-handling facilities, string arrays; and the screen will stop disappearing every time you hit the keyboard, or set the thing thinking. An overlay will be provided for the keyboard, to cope with the extra commands.

For the computer as it stands now, Melbourne House Publishers, (at 24 Peel Street, Collingwood, 3066) have made available by mail order a book called "30 Programs for the Sinclair ZX80". It includes games and educational programs and shows just what programming techniques are possible, including space compression, Peeks and Pokes and the USR function. At around $13.50 (including postage) it's considerably cheaper than buying programs on cassette.

Spot spotter

When a disk wears out, it doesn't do so all over its whole surface simultaneously. Instead, one or two spots flake away, causing errors. A program which keeps track of these spots and ensures that the system avoids them has been produced by Lifeboat at a US cost of $80 for systems using the CP/M operating system. Details from New York at 1651 Third Avenue, NY NY 10028, or phone (212) 860 0300.

Guy Kewney.

Heavy duty

Compulator's new Vector Graphic System 6 Micro has been officially approved by the Western Australian Education Department for use in schools. It's a compact system designed for heavy use such as you'd get in a classroom, based on the Vector Graphic system B computer and developed by Compulator to Education Dept. specifications.

First released in the US in early 1978, the upgraded model is now available in Australia for around $7,350. It's easily expandable from one to five independent users with their own VDU's, and each having access to the disks and 48K of RAM. It can support one or more printers, and interfaces to the Trudata Card Reader for batch processing. There are eleven high level languages available; and the system has full communication capability with other micros and time-sharing mainframes.

Information from Mr Lex Edmonds on (09) 321 5924. Compulator Australia is at Shops 11 and 17, Cloisters Arcade, 863 Hay Street, Perth, 6000.

MENSA COMPUTERS PTY. LTD.

Suite 3, 454 St. Kilda Road, Melbourne, 3004. Telephone: (03) 26-5683, 26-6150.

FINDEX — The Real Computer

THE WORLD'S FIRST PORTABLE MICROCOMPUTER
Battery or mains operated

RAM 48K to 2 megabytes, bubble memory to 2MB, gas plasma display, optional audio, printer, mass storage mini floppys to 800K bytes, hard disk to 195 megabytes, acoustic coupler, S-100 bus, battery optional, CPU with real time clock. For dynamic businessmen on the move. Ideal for real estate agents, insurance brokers and accountants.

SUPERBRAIN™ SERIES

BUSINESS SYSTEMS

Priced competitively from as low as $45.00 p.w. lease cost including sales tax and software.

Powerful, multi-purpose microcomputer systems.

TYPICAL APPLICATIONS

Debtors ledger and statements, creditors ledger and remittances, general ledger and trial balance, order entry/invoicing, sales analysis, payroll/wages, enquiry, word processing, mailing, record keeping, ledger card, doctors office, real estate, agency accounting, hotel/motel accounting, branch office accounting.
Facilities management consulting.
Software and computer sales.
Computer data preparation.

OPAL 1000

The OPAL 1000 is an 8 slot S-100 system conforming to the new IEEE standards. A Delta Products Z80a 4 MHz CPU card, with 2 RS232c serial and 3x8 bit parallel ports, is used in conjunction with the Delta Products Disk Controller. Memory is provided by a 4MHz 64k dynamic RAM Board by Measurement Systems and Control. The memory board is fully bank selectable and is designed for upgrading to a multi-user system. Disk drives are 2x8" Shugart SA801R running at double density (480k/drive) and fitted with our exclusive Disk Saver which prolongs the life of the drives and floppy disks by turning off the AC power to the drives 14 seconds after the last drive select and thus reduces routine maintenance. The Disk Saver also reduces the risk of data loss due to power failures. The software is CP/M version 2.2 with Delta Product's utilities which include DTEST (for testing drives and floppy disks) and M2 (a comphrehensive memory test program). The Delta PROM monitor enables fault finding to be carried out independently) of the Disk Drives. The system is mounted in an attractive pressed Aluminium housing with a cast front panel fitted with reset button and key operated on/off switch.

Dealers for Opal in Victoria.
Sole Distributor for Findex, Victoria and NSW.

SUPPLIERS FOR NDKS S-4000

MATHEMATICS

$$F(w) = aT\frac{\mathrm{Sin}\ wT/2}{wT/2}\ e^{-JWT/2}$$

$$e_{RMS}^2 = 4KTR(f_2-f_1)$$

$$L_1 = 10\log\frac{1}{80}\ X\ S_{\blacksquare}\ (dB)$$

$$A^2+B^2=C^2$$

$$A^2+B^2=C^2$$

$$F(w) = aT\frac{\mathrm{Sin}\ wT/2}{wT/2}\ e^{-JWT/2}$$

$$e_{RMS}^2 = 4KTR(f_2-f_1)$$

$$L_1 = 10\log\frac{1}{80}\ X\ S_{\blacksquare}\ (dB)$$

$$A^2+B^2=C^2$$

$$A^2+B^2=C^2$$

$$F(w) = aT\frac{\mathrm{Sin}\ wT/2}{wT/2}\ e^{-JWT/2}$$

$$e_{RMS}^2 = 4KTR(f_2-f_1)$$

$$L_1 = 10\log\frac{1}{80}\ X\ S_{\blacksquare}\ (dB)$$

$$A^2+B^2=C^2$$

$$A^2+B^2=C^2$$

$$F(w) = aT\frac{\mathrm{Sin}\ wT/2}{wT/2}\ e^{-JWT/2}$$

$$e_{RMS}^2 = 4KTR(f_2-f_1)$$

$$L_1 = 10\log\frac{1}{80}\ X\ S_{\blacksquare}\ (dB)$$

$$A^2+B^2=C^2$$

$$A^2+B^2=C^2$$

AUSTRALIAN
Personal
Computer

published by
AUSTRALIAN MICROCOMPUTER JOURNAL

PO Box 115
Carlton Victoria 3053
Telephone (03) 82 5783

PO Box 250
North Sydney NSW 2060
Australia

November 21, 1980.

Dear Subscriber,
APC was originally published late in May of this year as Volume 1 No. 1 May 1980. Due to a series of production delays, publication dates have fallen behind and so the decision was made this month to delete a month. Therefore the issue you have just received is Volume 1 No. 6 November 1980. Don't panic! We'll forward date your subscription by one month so that you will still receive twelve issues. In future, APC will be published in the middle of the month cover dated the same month.

The Readers Survey contained in this month's issue is not concerned with our performance in the area of subscription delivery, packaging etc. and particularly your satisfaction or not with your subscription. So, we would greatly appreciate your answers to the questions below in the hope that we can implement any improvements you feel are necessary.

Yours sincerely,

Michael Thomas,
Production Manager.

1. Are you satisfied with delivery time of your copy of APC in relation to its appearance on the newsstands?
   YES ___ NO ___
2. Does your copy arrive in good condition? (If not please elaborate) YES ___ NO ______________________
   ____
3. Any further comments? ______________________
   ____

Learning the game

That rather large company, IBM, is widely believed to have no part in the microprocessor market. True, in America it has set up one or two typewriter and dictating machine shops where the 5100 range of desk-top computers will be sold and software services provided, but that's hardly a threat to Radio Shack (Tandy).

Just as a snippet, I will pass on the fascinating detail that Atari Personal Computers will be distributed in America by Science Research Associates. Science Research Associates? It just happens to be an educational publisher . . . and it also just happens to be a wholly-owned subsidiary of IBM. It may lead to nothing – but it's a step in an interesting direction.

Guy Kewney

Intelligence

Don't be deveived by Intel's claim that it is changing its nature in talking about its plans for a 32-bit micro, an incredibly powerful mainframe computer on a chip.

It is true, as the company says, that normally it tries not to talk about future products, and it is also true that it it talking about a whole range of future products. What has happened to do this is not a change of attitude, but a shift of power.

My own relationship with Intel has become a love-hate one (I love them, they hate me) because of the vulnerable position the company has forced itself into. In the market, it has been impregnable, coming out with advanced products, getting the biggest share, and leaving Texas Instruments with egg on its face not just once but several times. In its press relations, the distance Intel has been in front of the competition has made it slightly paranoid about revealing too much, with things getting to the ridiculous stage of an exclusive interview being set up in a London hotel by a top Santa Clara executive, who sat in his bedroom suite and said "no comment" exclusively for an hour.

However it remains true that companies like Intel and IBM cannot keep information truly secret merely by saying no comment. When Motorola, normally number two or three in the micro market, stole a march on Intel with the announcement of plans for the 68000 micro – the big 32-bit micro that looks like a 16-bit micro – Intel's anxious customers approached their supplier and observed that the specification looked a great deal more sophisticated than the Intel 8086. Intel was then compelled to whisper a few secrets behind its hand.

So it was that first, the "8800" was rumoured (it's the basis of Intel's 32-bit microsystem) and second, the unofficial Intel view that the Motorola 68000 was beyond the capabilities of Motorola's technology. This latest rumour backfired. Nobody ever believed Motorola's claims about when the 68000 would be available (nobody seems to believe Intel's claims about the iAPX 432 range, either)but when Intel said that it would be, not just late, but never "because the chip is not viable" people deduced that it was beyond Intel. Intel, they said in the bars, must have tried it and failed. Hence the "break with tradition" and the willingness to talk about the iAPX (the i stands for intel) 432 and its supporting APX 186 and 286 families.

That willingness doesn't go all that deep. Most of the details released, while very interesting, are more conceptual than factual. The points Intel wants to make are not how many pins, and what voltage, and what clock speed, but first, we can build it and we will, and second, your old software will run on this. Normally, old software claims can be dismissed. There is, for instance, an Intel conversion package for re-writing 8085 code to run on the 8088. The 8088 is an 8086 (16-bit, big memory) with an 8-bit data bus – which means the user of an 8085 can get most of the power of the 8086, without throwing away his memory boards or system buses.

This package, say users who have tried it, is great for converting the sort of assembler code generated by compilers. Run a PL/M compiler, generate 8085 code: or run a Coral compiler, generate 8085 code, and that code can be converted to 8088 with ease and no loss of efficiency. The same does not apply to human generated code because humans tend to be cleverer than compilers. They tend to take advantage of oddities of the code, and no conversion program can really hope to reproduce the function of this sort of assembler writing on the next machine because it won't be aware of what foxy assumptions the writer has made about the condition code and so on.

When one gets to the 32-bit system, the APX 432, the power available makes it largely irrelevant that conversion software may be less efficient. Intel has no intention of providing an assembler for this system – it will provide a high level language, with the chip able to run instructions at a level normally handled by the operating systems on today's 8-bit micros. So Intel strikes a big blow in the credibility stakes, keeps its anxious customers happy, and the micro market can cheerfully ignore the whole thing for another two years. By then memory will be cheap enough for us to use the 8086 and double our memory size (because of the 16-bit words) without crippling the budget. And designers at Ithaca will have produced an APX 432 board for the S100 bus, and nobody will be able to afford it.

THE ZX80 COMPANION
(SECOND EDITION)
Now Available!

ORDER FORM: SINCLAIR EQUIPMENT (AUSTRALASIA) PTY. LTD.
308 High St., Kew 3101, Vic. Tel. 861 6224.

Quantity	Item	Item Price	Total
	The ZX 80 Companion	$16·00	

I enclose cheque/Bankcard/Diners Club/Amex

☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name____________________

Address____________________ Postcode__________

THE MICROCOMPUTER HOUSE PTY. LTD.

19 William Street, Alexandria,
NSW 2015. Phone (02) 699-4334.

JUST PLUG IN AND COMPUTE!

PET
PERSONAL
COMPUTER

USER 8K
USER RAM
CASSETTE
MONITOR

$999 complete

Call in and see our

Microcomputer House

- Specialised custom software for all your business applications
- Software development
- Conversion from 16K to 32K
- Sound units
- Exciting range of executive furniture for microcomputers from $285.00
- Extensive range of technical publications for 6502
- All microcomputer supplies

Sole NSW agents for

DATASOFT

- Business programmes covering a wide variety of standard business applications — accounts, estate agent pack, hotel database, portfolio management, Wordpro II and III
- Games and simulations — fast moving, quick thinking, exciting. See our extensive range.

TEACH YOUR PET NEW TRICKS
Select your software and try now.

K&L Computing Systems introduces the feature packed Archives Business Computer.

This highly versatile desk top unit provides high technology at a competitive price. Suitable for handling all the day by day business requirements, its features include:

- An extremely fast Z80 4MHZ Processor
- CP/M Operating System
- S100 Expansion Bus
- 64K RAM Standard
- 744K Bytes Disk Storage (Expandable)
- 25 Line x 80 col. Display

Available with word processor and complete accounting package, or software can be written to customer's specifications.

Also, see K&L's range of Apple II Plus Computers, floppy disk drives, video monitors, interfaces and expansion options.

- Language card with compilers for Pascal and Fortan
- Z80 Softcard with micro-soft basic compiler and CP/M
- DOS 3.3 upgrade kits (143K Bytes per disk)
- Paper Tiger printer with graphics

COMPUTING SYSTEMS
385-387 BRIDGE ROAD,
RICHMOND, 3121. TEL: (VIC.) 429 2122

KLR002

Just Released! Ricoh RP1600 Printer, a top quality Daisy Wheel printer ideal for word processing applications, at a highly competitive price.

OFFICE HOURS:
W/Days 9 to 5.30,
Saturday
9 to 12.00

bankcard
welcome here

YANKEE DOODLES

Tandy's new range

Radio shack (better known as Tandy in Australia has finally released the long-awaited information on its new computer line – three new products in all. The one that will probably do the best in the market place is the TRS-80 Model III. Rumour had it that the Model III would be a colour unit, but Radio Shack has reserved a surprise on that point – it has introduced a separate colour computer as well as a very interesting hand-held unit.

The TRS-80 Model III is essentially a TRS-80 in a single cabinet, except that the disks it uses are double density and it has a built-in RS232 communications interface, which is optional on the Model I. Two 178 kbyte disk drives can be mounted in the cabinet (a configuration is available without disks) and two more drives can be added externally for a total disk capacity of 670 kbytes.

Radio Shack says that Model III Basic has many more features than Level II Basic. These include a real time clock, expanded special character set and 500 or 1500 baud cassette operation. There's also provision for keyboard-controlled screen printing and printer/video routing. Model III TRSDOS additionally allows the creation of macros and has routines to operate the communications and clock features.

A 'bare bones' version of the Model III with 4k RAM and Level I Basic is priced at $699; a 48k Model III with two built-in disks is $2495. It isn't difficult to predict that the TRS-80 Model III will be a real market force during the next couple of years.

At first impression, the TRS-80 Color computer appears disappointing. It's an obvious outgrowth of the TRS-80 Videotex terminal to which Radio Shack has added RAM and a Basic language which supports colour. It has a 53-key keyboard which is not nearly the same quality as those on the other TRS-80 models.

The 'Extended Color Basic' resides in 16k of ROM, and there will apparently be 'Program Pak' ROM cartridges available for instantly loading games and other types of programs. There don't appear to be any provisions for disks or printers, but there's a cassette interface and connectors for two joysticks. The computer connects to the 300 ohm antenna terminals of a colour TV set.

The display is limited to 16 lines of 32 upper case characters, but the colour graphics resolution ranges from eight colours at 32 x 64 to one colour at 196 x 256. Some machine language programs can give a higher resolution. There's also an optional RS232 port and the unit can be used in conjunction with Videotex software for network communication.

Sharp's PC-1211 bears a striking resemblance to Tandy's new TRS-80 pocket computer.

Radio Shack's third entry is a handheld computer which runs Basic and bears a striking resemblance to a pocket computer made by Sharp in Japan which was secretly displayed at the last West Coast Computer Faire in March of this year. The TRS-80 pocket computer has a 24 character liquid crystal display and contains two 4-bit CMOS processors. One processor is dedicated to arithmetic operations while the other handles the Basic interpreter and keyboard I/O.

The operating software resides in 11k of ROM – 7k for the Basic and 4k for the monitor. There is an additional 2k of CMOS RAM for user programs. An optional cassette interface is available for storing programs and data; this is a somewhat larger unit that the computer nestles into and requires its own battery power supply.

It will be interesting to see how these new products fare, since they have all been introduced at the same time. It's my prediction that the handheld and colour units will do poorly because they appear to be rather inconvenient, but that the Model III will take off in fine style – check back in a year and we'll see.

The Winchesters

Certain breakthroughs appear to be hastening the advent of low cost Winchester disk technology in relatively small and inexpensive computer systems. Some of the factors that have inhibited the widespread use of the Winchester drives had been the problems of backup and the cost of the controller. In the past, controllers have literally been more expensive to build than the Winchester drives themselves.

This is partly because such controllers should include features found on large systems such as error checking and correction and diagnostics. One solution to this dilemma has been found by Microcomputer Systems Corporation of Santa Clara. It has developed a controller module for Winchester drives that can be adapted to almost all the 8 and 5¼ inch drives now available.

The module contains a microprocessor, logic and some ROM that is adapted to the given drive. Then interface logic can be built up from readily available LSI chips to mate the controller to the drive on one side and the host computer bus on the other. Using this approach, MSC has put together a controller that will run the new 5¼ inch Shugart Technology Winchester on a Hewlett-Packard HP-85. This results in a system with close to six megabytes of disk storage for less than $7000 and which fits on a desktop.

Other drive manufacturers are jumping on the bandwagon. Memorex and MSC have sponsored joint OEM workshops with computer manufacturers to assist them in using the MSC controller module to adapt Memorex Winchester drives to a wide range of processors and buses. This trend will no doubt result in massive hard disk systems in places where it would not have been thinkable a short time ago – even in homes!

This is by way of being a gadfly, a bubble-popper, indeed little short of a wet blanket. There are a lot of illusions and tacit assumptions afoot about the future of microcomputers, which, while not impossible, do tend to gloss over many of the problems standing in the way of all those delirious dreams.

"...compromises have been made which turn out to be quite inefficient."

Computers are getting bigger as they grow smaller. We are now witnessing the spectacle of galloping hardware development outracing the ability of the software industry to keep up – let alone to fully utilize the enhanced capabilities of the newer processors. Not only have newer operating systems come along which try (not always successfully) to be compatible with existing applications programs but in trying to adapt existing operating system software to newer hardware, compromises have been made which turn out to be quite inefficient.

A classic example came with the introduction of hard disks to micros. Existing operating system software was not able to efficiently handle the increased capacity because the sector size was geared to floppies and required too great a percentage of disk space to keep track of directory and other housekeeping. In a couple of instances the hard disk itself was not treated as a physical entity, but was divided up into "virtual disks" that appeared to the programmer just like a large number of floppies. This may at first seem to be a convenience from the user's point of view, but it's really just a patch and terribly wasteful of space on the hard disk.

So what are people going to do with 16-bit micros, and (saints preserve us) the 32-bitters? No doubt there'll be a great many fascinating things that can be done with them, but it will be a shame if the software proves to be an impediment. The increased speed and capacity of the new machines could really bring about the level of simulation – colour, real time, complex parameters, etc. that have been in the dreams of educators but which are not yet really possible on today's 8-bitters. It's well to realize that hardware alone won't do the trick.

Another popular myth, prevalent in one form in Australia and another in the States, is that access to huge data bases will instantly give us all that information we need to make our lives simpler and more productive. Yes, data bases *will contain* a great deal of information, but getting to that information and *getting* it in a form we can easily use is not a problem that's seen a lot of attention.

"...a shame if the software proves to be an impediment."

The shape and organisation of a data base tends to reflect the interests and priorities of the people who created it and not those of a broad and general public. We often walk into a library to research a problem that we've only vaguely defined in our minds. It's only after interacting with the 'data base' *and* with human resources (librarians and bibliographers) that we are able to focus the direction of our search. This direction may take us on an entirely different path than we originally anticipated. The point is that in a library – a social institution – we're dealing with more than just structured information. In today's data bases, the user is left on his own to find a way through the maze, or, worse, yet, is led along a narrow path wearing blinkers which prevent him from seeing things that might aid his quest.

At the risk of sounding downright reactionary, I'll allow myself the following analogy. It's been said of microcomputers that they represent to the human mind what steam engines of the Industrial Revolution meant to human muscles. Human production did take a quantum jump as a result, but there's another side to the analogy . . . over-reliance on machines caused some people's muscles to go flabby. I submit that the same can be said of micros.

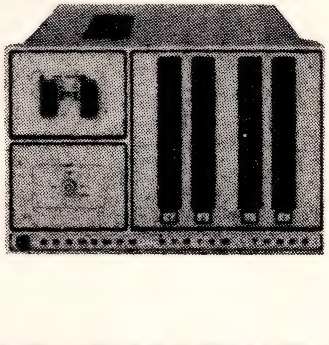
I'm thinking, for example, of the newer cash registers, which instead of numbers on the keys, have pictures of the sandwiches, drinks, etc. served by the establishment. Theoretically, one could train an orangutan to operate such a machine (the only impediment being the unions) but what if something goes wrong? It's here that I cease my ravings and turn to substantive items.

On the business orientated front, look for something new from Germany in the near future. A certain company there is preparing to market a machine put together out of the German Kontron system, a very sophisticated machine with high resolution black-and-white graphics and the new 5¼" Winchester disk, drive by Shugart Technology (not to be confused with Shugart Associates, the original company). This should mark the first instance of a consumer/personal computer using the new, small Winchester.

For much more sophisticated systems. National Semiconductor has introduced a new family of 16-bit microprocessors, the NS 16000 line. One member is especially adapted to handle high level languages, and another can, in combination with a memory management chip (MMU), be used to construct a computer with virtual memory capabilities.

"...the user is left on his own to find a way through the maze."

In virtual memory, the processor generates 'virtual addresses' and the memory manager then translates these into physical addresses which can be either in RAM or on disk. The important thing is that to the programmer, all addresses appear as if they are part of one, continuous memory. It may well be said that such capabilities are beyond the abilities or needs of users of personal computers. But, bearing in mind my earlier tantrum, if proper software is developed to take advantage of the power—software that is a *superset* of existing software – then human imagination will do the rest, and we needn't worry about our brains going flabby.



Cromemco
incorporated
Tomorrow's Computers Today

In the microcomputer field, the Cromemco System Three and Z-2H Winchester Hard Disc Systems stand alone in the range of features and capabilities offered. These systems are based on the Z-80A chip, and have from 1-4 mbytes of diskette storage, and from 10-80 mbytes of hard disc storage, combined with the widest range of software available in the industry, including Multi-user, Multi-tasking operation.

The computers have a large S100 motherboard and the operating system is a Superset of CP/M, thus allowing a wide range of non-cromemco hardware and software to be used. This also provides "obsolescence insurance". Some of these features include high resolution colour graphics, Eprom programmers, remote terminal emulation, and card reader interfaces.

Cromemco Basic, available in 3K, 16K, and 32K structured/KSAM versions, is fast, efficient, and ideal for teaching purposes because of it's dynamic error trapping on entry, and easy file handling. Cromemco Fortran IV and Cobol are equal in power to those found on mainframes, and of course, Pascal, C, and other high level languages are also available.

Informative Systems, Cromemco's authorised centre for sales and service, have installed many systems throughout Australia, backed by Cromemco trained technical staff offering maintenance, support and user training.

INFORMATIVE SYSTEMS Pty Ltd
Specialists in professional microcomputers and high performance computer support products.
3 Bank Street, South Melbourne, Vic 3205
Sydney (02) 680 2161
Telephone (03) 690 2284 Telex 30458 INSYST

The one-stop Microcomputer Shop for total service to TRS-80* users

*TRS-80 is a registered Trademark of Tandy Radio-Shack

CISA

NOW AVAILABLE
CISA DISK PASCAL

Executes up to 60 times faster than DISK BASIC.
HAS FULL DISK I/O FEATURES and many facilities not available on languages costing many hundreds of dollars.
DO NOT CONFUSE WITH CHEAP CASSETTE-BASED 'TINY' PASCALS.
Systems overlays and developments will be available to registered users at a nominal charge.
Includes the fastest and most powerful screen editor we have seen.
Will edit PENCIL, SCRIPSIT and ASCII files.
PASCAL is much easier to manipulate than ASSEMBLY, and is practically as efficient as it compiles into a true-optimized machine-code.
More efficient than currently available BASIC COMPILERS selling for twice the price.
We honestly believe that this Australian written PASCAL to be the fastest, most sophisticated and powerful high-level language available anywhere in the world for the TRS-80 Model I.

RELEASE 1.0 $99.00

(numbered copies to registered single-users only)

"HISPED"
TAPE OPERATION

2K Baud PLUS for the TRS-80*
Save, verify and load programs up to 4 times faster than normal
Save, verify and load array data up to 30 times faster than PRINT
User variable hardcopy formatting (3 output routines work with most printers)
"HISPED" is a machine language program (not a hardware add-on)
2 copies plus a free basic test program supplied on high quality cassette — for level 2, 16K, 32K or 48K.
MAKES STRINGY FLOPPIES REDUNDANT

$24.95

Available only from Cisa and authorised agents

CISA HARDWARE AND MODS

HEAVY DUTY POWER LINE FILTER
Essential in most domestic situations. . $65
CISA LIGHT PEN (again in stock)
Includes full documentation and sample program $19.95
CISA DATA DIGITIZER
Use this with HISPED program and you really have a business system in LEVEL 2
Requires no system modifications . $57.50
AUTOMATIC TELEPHONE DIALLER
Easy attachment to TRS-80. Requires no hardware mods. Complete with softwares and documentation $57.50
16K UPGRADE KITS
KEYBOARD KIT. $85.00
INTERFACE KIT (yes there is a difference) $105.00
We fit — $20.00 plus carriage $5 overnight return.
DISK DATA SEPARATOR
These are the components that TANDY forgot. Virtually eliminates all disk I/O errors. Absolutely essential for 77 track users. We fit. $49.95
(sorry no kits)
GREEN PHOSPHOR TUBES
Not a cheap plastic overlay. We fit a genuine professional standard VDU tube with ¼" armoured low reflective front panel.
(no kits) $99.00
(fits old and new type Tandy VDU and current Dick Smith monitor)
CISA RS232 PRINTER-DRIVER
Operate and RS232 or 20MA serial printer with this Australian made unit. Includes software $54.75
LOWER CASE MODIFICATION
Get video lower-case for BOTH Scripsit and Electric Pencil. Fitted. $49.95
VIDEO STABILISER CRYSTAL
Totally removes shimmer and wobble on your video. Highly recommended for Green Tube.
Kit $19.95
Fitted. $39.95
DUMMY PRINTER
Plug this into the parallel port of the interface and avoid system lockups if you accidentally type LLIST or LPRINT $14.95

TRS-80 SOFTWARE

AIR TRAFFIC CONTROLLER L2/16K
Supervise a large area of air-space in real time. $9.95
SPACE GAMES L2/16K
Five brilliant games in the classic space series $14.50
STRATEGY GAMES L2/16K
Four fascinating games to test your judgement and logic $14.50
ADVENTURE SERIES L2/16K
Adventure-1, The Count, Voodoo Castle.
Each $14.95
Z-CHESS
A fast and exacting opponent. 6 levels of play. L2/16K $19.95
Disk 32K. $24.95
DISASSEMBLER IN BASIC L2/16K only
Disassembles ROM and high memory machine language routines $9.95
TAPECHECK L2/16K plus
Checks and verifies every millemeter of a cassette tape. Also useful as cassette I/O diagnostic $9.95
RS232 DIAGNOSTIC 32K/DISK
Interrogates, tests and reports on EVERY feature of Tandy RS232 board . . . $19.95
FLOPPY DOCTOR 32K/DISK
This is the most comprehensive and exacting series of memory and disk I/O tests we have seen.
From Micro-Clinic, USA. $29.95
SIMUTEK 7 separate packages
These seven packages are excellent value for any TRS-80 owner . . . . . . $14.95 ea.
Plus many, many more.

MICROPOLIS DRIVES FOR THE TRS-80*

For the enthusiast: 192K bytes per drive.
SINGLE 77 TRACK $699.00

A professional disk drive for the business user:
TWIN 77 TRACK 385K $1499.00
Both complete with heavy-duty case and inbuilt power supply and free despatch to TRSDOS. Requires cables — 2 drive $30, 3 drive $40, 3 drive $50.

MIX 'N MATCH with any 35 or 40 track drive. SHOP WHERE YOU CAN BE SURE OF SERVICE BACK UP AND YOUR WARRANTIES HONOURED.

SOFTWARE FROM RACET

INFINITE BASIC $49.95 L2 and DISK
Add 30 BASIC commands plus full MATRIX MANIPULATION.
Add 50 STRING functions, including high-speed sorts.
BUSINESS BASIC (requires INFINITE BASIC). $29.95
Another 20 functions including set printer parameters, 127 digit mathematical functions binary array searches and hash code generators
COMPROC Command Processor for Disk $19.95
Auto your system to any sequence of DOS, machine-language or BASIC routines.
Includes screen-print, auto debounce and lower-case software driver.
DSM Disk Sort and Merge Min. 32K and Disk. $75.00
Sorts 85K diskette in less than 3 minutes.
Sorts 190K diskette in less than 6 minutes.
COPSYS for cassette systems $14.95
Copy and verify virtually any machine-language program.
GSF 32K and 32K DISK. $34.95
18 high-speed machine-language routines including high-speed in-memory sorts.
Sorts a 1,000 element string array in 6 seconds.

PHONE OR CALL AND BROWSE. TRADE ENQUIRIES INVITED

Trading Hours: 9am to 6pm Monday — Friday, 9am to 12.30pm Saturday

All the above fine products are available at or can be ordered from:

SOFTWARE-80, Shop 11/198 Moggill Road, Taringa, Brisbane, QLD. 4000. Phone: (07) 371 6996.
SOUTH COAST COMPUTING SERVICES, 90 Worrigee Street, Nowra, NSW. 2540. Phone: (044) 24967
THE BYTE SHOP, Colbee Court, Phillip, ACT, 2606. Phone: (062) 81 5011
TANDY ELECTRONICS, Springets Arcade, Bowral, NSW. 2576
H.S. ELECTRONICS, 104 Charles Street, Launceston, TAS. 7520 Phone: (003) 31 8942
WACB RADIO CENTRE, 129 Fitzgerald Street, Perth, W.A.
COMPUTERWORLD, Gallery Level, Woden Plaza, ACT. Phone: (062) 81 1368
BUNBURY BUSINESS EQUIPT, 40 Spencer Street, Bunbury, W.A. 6230. Phone: (097) 211977.

CISA MICROCOMPUTING PTY. LTD.

159 KENT STREET, SYDNEY, NSW 2000. PHONE: (02) 241-1813.

Orders under $100 add $2.00 p and p. Over $100 post free.
For repairs and modifications to systems — send by carrier — you pay, we pay return carriage.

PETER HATCHER

INTRODUCES A NEW CONCEPT IN PERSONAL COMPUTER SHOPS.

sinclair ZX80

Undoubtedly the most impressive piece of computer design for years, the **SINCLAIR ZX80** opens the door for everyone to have their own powerful home computer system. At less than $300 the ZX80 is delivered fully assembled, with all leads required to connect to your own cassette recorder and television.

The SINCLAIR ZX80 is probably the most cost effective and powerful educational tool available today. How better to prepare yourself or your children for the computer age than with your own home computer system? And at these prices everyone can afford one.

Two unique components make the SINCLAIR ZX80 ideal for the first-time user and the experienced programmer alike:

The BASIC interpreter offers remarkable programming advantages. By offering unique "one touch" keyword entry, the ZX80 eliminates a great deal of tiresome typing. Key words (eg. RUN, PRINT, LIST etc.) have their own single key entry. Also, by means of a unique Syntax check, only lines with correct syntax are accepted into programs, thus avoiding a lot of time-consuming de-bugging.

The Sinclair teach-yourself BASIC manual is free with every ZX80 and packs 96 pages of instructions on how to use your new computer.

And the story doesn't end there. Why not get "The ZX80 Companion", an 80 page book giving more helpful information on using and programming your ZX80 and containing some program listings. And if you need more memory, expansion boards and RAM chips are available.

The ZX80's are being sold as fast as they arrive in the country, so don't miss out on your chance to acquire one now. Simply choose what you want from the table below (don't forget the mains adaptor) and fill in the order form on this page.

ITEM	PRICE
SINCLAIR ZX80 Personal Computer including ZX80 BASIC manual (but excluding mains adaptor)	$295.00
Mains Adaptor (600 Ma at 9V DC nominal unregulated)	$16.00
"The ZX80 Companion" book	$16.00
SINCLAIR ZX80 Manuals (one free with every ZX80 computer)	$15.00
Memory Expansion Boards (take up to 3K bytes)	$38.50
RAM memory chips — standard 1K bytes	$10.00

November sees the opening in Sydney of a new shop dedicated to the personal computer user. And it's a shop with a difference.

For one thing, we're **right in the heart of Sydney** near Centre Point, so you don't have to travel all over the suburbs to find us.

The biggest difference though is our range of products. No more will you have to visit 3 or 4 "one brand" shops to make your personal computer choice. From our one shop we will supply **FOUR** different makes of computer and all the accessories to go with them. We'll also have just about the largest range of software in New South Wales, plenty of books on everything to do with computers, and a complete selection of discs and tapes for you to use on your system.

Our computers start at around $300 for the new Sinclair ZX80, through the Dick Smith System 80 and the Exidy Sorcerer to the amazing Apple II. And we'll be adding to our range to provide you with the BEST in personal computing.

If you don't want to pay in one lump sum we'll be happy to arrange **finance** for approved applicants so that you can enjoy your computing on easy term payments. And with our special software offer (see below) we'll help you expand your library of programs to get the most out of your computer.

So there you have it. All your computing needs under one roof, and right in the heart of the city too. Come along and see us or, if you live too far away, send for our free comprehensive catalogue. Either way we're looking forward to providing you with first class service to make computing as simple and enjoyable as possible.

SPECIAL SOFTWARE OFFER

As agents for **DEFOREST SOFTWARE** we aim to bring the broadest possible range of software to New South Wales. We have programs for TRS-80's, System 80's, Sorcerers, Apples and Pets — both business and pleasure.

But there's **ONE BIG DIFFERENCE.** With every program purchased from us, you'll receive a special software voucher. Collect ten vouchers and we'll exchange them for a FREE program of your choice up to a value of $30.00.

So not only do we offer more software — we make it easier for you to get it too. So choose your program from those listed below, or send for our free catalogue.

TRS-80

Sargon 2 — The ultimate Chess Game for any Microcomputer 16K Level 2	$37.50
Microchess — Level 1 or 2 TRS-80. Plays an entertaining game 3 levels fits in 4K	$24.00
Golf & Crossout — New improved version, good graphics. You can even design your own championship course.	$10
Santa Paravia — up to 12 can play, become the king of a medevil city, levee taxes	$10.00
Game Playing with Basic — 3 tapes 1, 2 & 3 based on the book of the same name great for learning	$12.50 ea.
Oil Tycoon — 2 players, explore, drill for oil, outprice the opposition, force him into bankruptcy	$10.00
Space Trek IV — population simulation, trade or wage war send missions to space, can you survive?	$10.00
Checker King — not just an ordinary checker game but a fast expert machine language challenge.	$27.00
Flight — Control your own aircraft, very realistic, good flying simulation and very challenging	$10.00
Airmail Pilot — an entertaining game can you get the mail through in your 1927 Biplane, watch for lightening, windstorms, fuel shortages etc.	$10.00
Night Flight a new exciting game from Instant Software	$12.50
Flight Path from Instant Software	$12.50
Adventures — what more can be said! The most challengiog simulation/game/adventure ever Nos. 0 to 9.	ea. $16.00
1 on Disc	$19.00
2 on Disc	$32.00
3 on Disc	$39.00
Backgammon/Keno — 2 great gambling games from instant software	$10.00
Mind Warp — A series of great programmes	$12.50
I.Q. Test — See how smart you really are	$12.50
Bandito — Your TRS-80 a slot machine with great sound effects	$12.50
Star Trek — Acorn a space adventure on your TRS-80.	$12.50
Stock Market — Invest in safe stocks or high risk specs. will you take the risk	$12.50
Original Adventure — requires 32K & disc from Microsoft.	$35
Monolopy — Play that famous game against the TRS-80.	$10
Time Trek — with sound, another of the 'classics' for the TRS-80 real time excellent programme	$21.00
Galactic Empire — a space game with a difference, many hours enjoyment with this one.	$16.00
Light Pen — games & instructional program includes game frogs (Light Pen included)	$10.00
Space Battles — requires 32K 1 disc	$15.00
Games 20 — only 75 cents per program on disk	$15.00
Pinball — the greatest game that I have ever seen for the TRS-80, fast action movable flippers and great sound. Machine language, maintains high score Disk.	$20
Tape.	$16
Super Space Invaders with Sound — nothing like the normal invaders extra fast. Spray bullets like out of a hosepipe, not only does the enemy move sideways but they also advance Disk	$20
Tape	$16
Lying Chimps with Sound — a very interesting program	$10
Chessmate 80 — This programme forced a draw with Sargon 2	$24
Othello — An old favorite	$12.50
Typing Teacher —	$10
Your Cribbage & Checkers Partner	$12.50

PET

TREK X with sound (for R&T)	$10
Backgammon and Keno	$10
Space Trek 2	$10
Code Breaker with sound	$17.40
Gammon Challenger — 3 levels of play	$17.40
Barricade — "Machine Language Arcade Game"	$10.00
Backgammon — Machine Language	$16.00
Some common basic programmes	$17.50
Dungeon of Death	$10
Chimera	$12.50
Santa Paravia	$12.50

APPLE

Golf	$10
Bowling · Trilogy	$10
Oil Tycoon	$12.50
Sahara Warning	$10
Space Wars	$10
Air Flight Simulation	$12.50
Santa Paravia	$12.50
Conflict — a marvellous war game, requires disk; 32K Ram and Applesoft	$25.00

SENSORY CHESS CHALLENGER

SCC

ONLY $249

The First Thinking Chess Game That "Sees" Every Move You Make!

SENSORY CHESS CHALLENGER* "sees" every move you make and records it automatically. Match your skill against the Computer's "brain". Improved programming lets you play at any level of difficulty from beginner to expert. Works on batteries or plugs into any home wall outlet. . .play any time, anywhere!

New sensory playing surface automatically tells the Computer your every move — from and to — and which piece was moved. The squares light up to graphically show you the Computer's next move. No keys to press — you don't have to learn programming procedures — **SENSORY CHESS CHALLENGER*** lets you devote all your attention to the game.

Plus these proven outstanding features:

1. Eight levels of play: Beginner to expert, including "Mate in Two" and "Chess by Mail".
2. Levels changeable during game: Change from 1 to any level through 8, at any time, on any move.
3. Random computer responses vary every game. Your computer opponent will make it interesting each and every time.
4. Selection of legal offense or defense play: Play from the bottom or the top of the board. Choose black or white.
5. Position Verification by computer memory recall.
6. Plays opening defenses from chess books, i.e. Sicilian, French, Ruy Lopez, Queen's Gambit Declined.
7. Analyzes as many as 3,024,000 board positions. Uses up to 32,000 bits of Read Only Memory.
8. Audio feedback: Single tone each time you press key; double tone when Computer responds.
9. Problem Mode: Establish your own chess positions and watch the Computer react.
10. Add or subtract pieces during game: Put back the piece you lost by override or take away the Computer's queen for a more even game.
11. Pawn promotion to selected piece: Promote a pawn to a queen automatically, or select a knight or another piece instead.*
12. Plays against YOU; plays against ITSELF; changes sides in MID-GAME.

Numerous other features include durable molded housing, uses four "C" size batteries (batteries not included) or plug-in transformer, 100% solid state.

SEND TO: PETER HATCHER, BOX 4715 G.P.O., SYDNEY 2001 N.S.W.

ORDER FORM:

bankcard welcome here

Quantity	Item Description	Item Price	Total

☐☐☐☐☐☐☐☐☐☐☐☐☐☐

TOTAL $ ______

Name: . . . .

Address: . . . .

. . . .

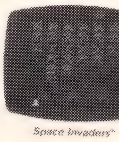
. . . . Postcode. . . . .

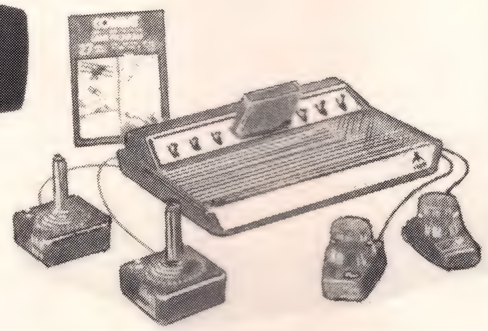
Bankcard Expiry Date:. . . . .

Signature. . . . .

PETER HATCHER

75 CASTLEREAGH STREET,
SYDNEY
BOX 4715 G.P.O. SYDNEY 2001





THE AMAZING
ATARI
VIDEO COMPUTER
SYSTEM

ONLY $269
INCLUDING "COMBAT"
GAME PROGRAM

BUT HURRY!
STOCKS WON'T LAST

As a SPECIAL CHRISTMAS gift idea we are offering the amazing **ATARI VIDEO COMPUTER SYSTEM** at only $269. It's supplied with joystick and paddle controllers, and the COMBAT game program cartridge so that you can enjoy the fun and excitement straight away.

And you can choose more game cartridges from the library of over 30 – from the famous SPACE INVADERS to AIR-SEA BATTLE and BACKGAMMON. And more games are becoming available all the time.

And as a **SPECIAL OFFER**, you'll receive a voucher with each game cassette you buy from us. Save 10 vouchers and we'll give you a **free cassette** of your choice.

Now, fill in the order form below and choose your cassettes, but hurry because stocks are limited.

ATARI PROGRAM CARTRIDGES

- Air-Sea Battle
- Starship
- Space War
- Outlaw
- Slot Racers
- Canyon Bomber
- Street Racer
- 3-D Tic Tac Toe
- Video Olympics
- Breakout
- Home Run
- Basketball
- Football
- Human Canonball
- Bowling
- Sky Diver
- Circus Atari
- Night Drivers
- Golf
- Surround
- Flag Capture
- Black Jack
- Slot Machine
- Fun with Numbers
- Hangman
- Miniature Golf

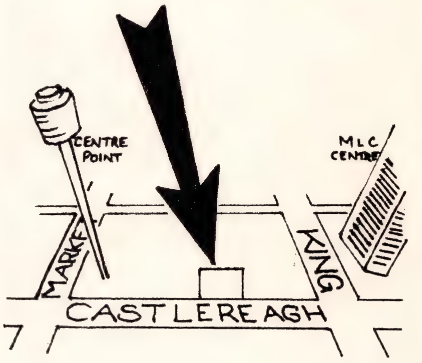
. . . . **EACH $39.95**

- Space Invaders
- Adventure
- Superman
- Casino

. . . . **EACH $49.95**

- Indy 500
- Backgammon
- Video Chess

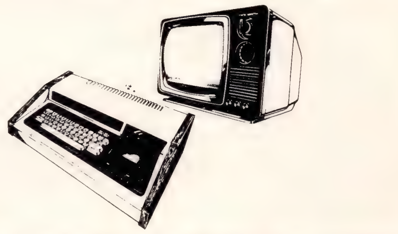
. . . . **EACH $59.95**



SYSTEM 80 AND EXIDY SORCERER

We're happy to have been appointed distributors of DICK SMITH Computer Products. So now you can obtain the 'Tandy Compatible' System 80 and the quality Exidy Sorcerer, plus the complete range of accessories and software from the personal computer specialists. Some examples . . . . .

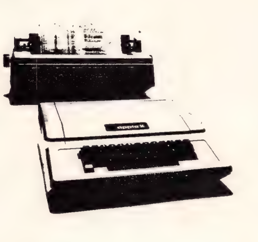
SYSTEM 80 with built in cassette, 12K level II BASIC, demonstration tape.
plus 4K RAM. $595.00
plus 12K RAM. $695.00



Video monitor (suits virtually all systems) $149.50
Discs for TRS-80 or System 80:
1st Drive with power supply, harness and D.O.S. $508.45
2nd Drive $379.00
(See also STRINGY FLOPPY on this page)
Light Pen9 for use with TRS-80 or System 80 includes demonstration tape. . . . $29.50

EXIDY SORCERER with 8K BASIC ROM Pac, RS 232 Serial I/O and S-100 bus compatible.
with 8K RAM $1295.00
with 16K RAM $1395.00
SORCERER S-100 Expansion Bus . .$499.00
MICROPOLIS Quad Density Disc Drives
1st Drive with controller board and D.O.S. $1350.00
2nd Drive . . . .$ 750.00
16K RAM Expansion Kits; contain top quality I.C.'s
For Sorcerer, TRS-80 and Apple . . .$109.00
C.ITOH Quality Dot Matrix Printer. .$970.00

apple computer systems



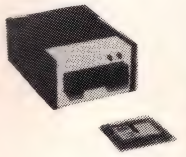
As an authorised dealer we are proud to be able to offer the full range of APPLE hardware and software. Whether for business or pleasure use, few systems come close to the flexibility and sophistication of APPLE. The number of accessory options and the range of software is phenomenal. For the businessman there is a full range of software from billing and accounting to word processing and payroll. For recreation there is a variety of games and some of the most sophisticated colour graphic capabilities possible. Why not call in and see the APPLE, or send for our free catalogue.

APPLE II plus 16K RAM	$1604.25
16K add-on RAM	$ 143.75
'PAL' colour card	$ 201.25
R.F. Modulator	$ 40.25
SOFTWARE: Some examples	
Wordmaster 3 word processor	$ 295.00
Stock Exchange prices tracker	$ 150.00
Apple Invaders	$ 24.95
Sink the Bismark	$ 59.95

ATTENTION TRS-80 AND SYSTEM 80 OWNERS

Fed up with slow tape recorders on your system? Do you spend ages searching for programs? The answer is the remarkable **EXATRON STRINGY FLOPPY**. No more manual controls to press and levels to adjust. STRINGY FLOPPY is a compact high speed tape transport system, entirely under the control of the computer, designed for DATA, not music.

Unlike cassette recorders STRINGY FLOPPY uses specially designed "wafers" containing endless loops of chromium dioxide tape.



STRINGY FLOPPY comes complete with everything needed to connect it quickly to the TRS-80. A special adaptor is available to connect it to the Dick Smith System 80. We even include a box of 10 mixed length wafers and it carries a six month limited warranty.

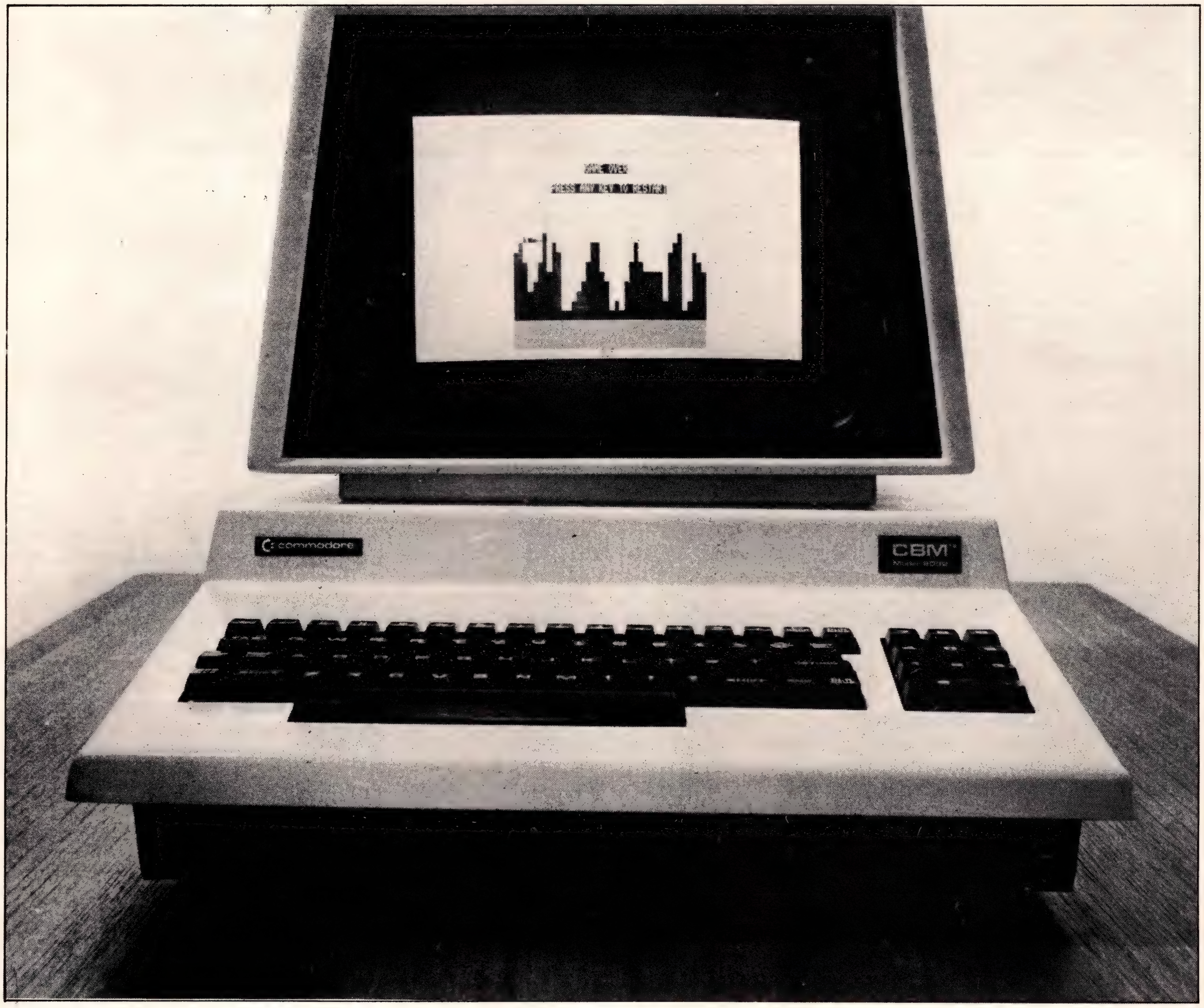
"The quality of both boards and workmanship is far superior to that normally expected in the hobby market, and can be summed up in one word – professional". – Thomas Murphy APC July 1980

STRINGY FLOPPY, with operating system, plug pack power supply, data I/O program and box of wafers – FOR TANDY TRS-80 . . . . ONLY $350.00

Adaptor for connection to Dick Smith System 80 (includes power supply and provides extra parallel printport) $125.00

BENCH TEST

CBM 8032



Some call it the Jumbo, others refer to the SuperPET, but image-conscious Commodore has christened its 80-column PET the CBM Model 8032. It no doubt feels that PET is a bit of a silly name for a machine so clearly aimed at the business market. This month David Tebbutt puts the system through its paces and assesses its chances of success.

Commodore's long-awaited new computer comes as welcome news to all those who want a PET but feel it's not quite 'grown-up' enough for them. Mainly businessmen, they will find the 80-column screen and full keyboard overcome most of the earlier machine's limitations. Programmers used to the PET will find the new computer a bit annoying at first but they'll soon get over that.

Only one model will be offered — the 8032 with 32k of RAM of which 1k is reserved for system use; the rest is available to the user. As with PET, the Basic interpreter and the monitor are safely tucked away in ROM.

Hardware

The 8032 retains many of the features of its illustrious predecessors. The integral 12" 'green screen' monitor is fixed to the main unit which incorporates a standard typewriter keyboard, numeric keypad and half a dozen control keys. With its metal casing it weighs in at around 50 lbs (for the benefit of younger readers, that's about 22 kilograms) and the whole unit fits adequately into the passenger seat of

Technical Data

CPU:	6502
Memory:	32k (31k user) RAM
Keyboard:	Full ASCII, numeric pad, full cursor controls
Screen:	25 lines x 80 characters, green, memory mapped
Disk Drive:	Coming soon — twin 5¼", 950k
Bus:	IEEE-488
Ports:	Cassette, memory expansion, parallel
System Software:	DOS and Monitor
Languages:	Basic

an X19 although, for the review, it seemed more at home on the dining room table.

Despite Commodore's anxiety to dissociate the 8032 from the PET, the two are very similar in appearance and performance. Games addicts will be pleased to learn that all the graphics characters can be displayed, although only 26 of them are accessible from the keyboard. 'Pi' is one useful character that's all but lost. While Commodore is clearly right to offer a typewriter keyboard there are many thousands of PET programmers who will find it strange that they must press the shift key to generate even common characters such as plus signs or quotes. Perhaps Commodore would like to consider a graphics keyboard option as it does with the PET. Three new keys have been added — tab, escape and repeat, and the run/stop key has been sensibly moved out of harm's way to the top right of the main keyboard. The feel of the keys is neither better nor worse than on most other machines, and they have the same tendency to emit strange 'boings' when released quickly.

The screen can display 2000 characters in 25 lines of 80 columns. The character generator in ROM contains two sets of 128 characters, each of which may be displayed as green on black or vice versa. Although Commodore isn't offering alternative character sets, it would appear that the standard chip could be replaced by a 2716 or similar EPROM. Switching between the two character sets is performed in software, either by POKEing location 59468 (as on PET) or by printing a control character.

The usable screen area is about 8½" wide by about 6½" deep and, to maintain the proportion of text, there is a blank strip between each line of the display while in text mode. Although graphics characters may be displayed while the screen is configured for text, they appear strangely disjointed so Commodore has incorporated a special 'graphics' display mode. The key sequence print-quote-escape-reverse-shift-N-return (don't worry, you'll soon get the hang of it) removes the interleaving blank strips from the display which then reduces in height to a little over 5". The characters don't alter in size and text is quite readable, albeit a little cramped.

Programs and data may be stored either on cassette or disk though neither unit is supplied with the machine. Commodore sells a cassette unit without sound or tape counter for $126 and the 3040 floppy disk unit, costing $2305, provides 343k of user storage. Only one unit can be connected, so it is good news that a new dual drive (the 8050 offering 950k) is now available at $3100. A 3040 disk unit was loaned for the review and any comments will relate to this model.

The innards of the 8032 appear little different to those of its more recent predecessors, though the layout of the main board has been turned through 90 degrees so that the RAM chips now run alongside the heatsink. A larger Basic and operating system mean that only two sockets are left for ROM/PROM expansion — the addresses from B000H to BFFFH have already been taken. Given that the 8000 series is meant for serious users, it's not surprising that Commodore has failed to publicise the built-in soundbox. Come to think of it they might have trouble with the Trades Description Act if they did. Its only built-in function is a 'bell' that chirps five characters before the end of each line with a sound reminiscent of chalk on a shiny blackboard. The bell effect is achieved by playing a jolly jingle, the speed of which can be varied from 0 to 2¾ seconds by POKEing 231 with a value from 0 to 255 — Commodore uses 16. Prospective buyers are strongly recommended to try 'POKE 231,0' when the salesman's back is turned.

Connections to the outside world are exactly the same as on the PET: an IEEE-488 interface, a parallel user port, a cassette interface and a memory expansion port. The most useful of these is the IEEE-488 edge connector to which Commodore printers and disks may be attached as well as the more usual scientific and laboratory equipment. Other makes of peripheral may require a special interface between them and the 8032.

Software

The 8032 comes with Basic 4.0 in ROM. Existing PET owners will be pleased to learn that the garbage collection problem is responding to treatment, though it has unpleasant side effects — more about that later. The other major change is that 15 disk commands have been added, representing a vast improvement on the previous disk handling procedures.

One of the 8000 series brochures refers to 24k of ROM. The review machine was presumably still growing, because we could find only 18k, of which 1k was unused. If Commodore expands its Basic it should consider adding commands such as LINE INPUT, INSTRING and MERGE, which are very noticeable by their absence.

An interesting feature of the CBM range is that only the most rudimentary disk handling is carried out by the main processor. Most of the work is carried out by another 6502 housed in the disk unit, and therefore many functions take up very little of the 8032's processor time. The disk unit tested was fitted with DOS 2.1 ROMs which are free from most of the bugs which plagued earlier versions. However, the use of DLOAD to chain from one program to a larger one results in the second program being corrupted and this could prove a slight problem for those writing large systems. Although CBM's relative (ie random) file handling is somewhat esoteric, after a few hours we felt quite at home with the commands.

Data storage efficiency is somewhat erratic, ranging from the sublime, in which records are allowed to cross physical sector boundaries, to the ridiculous, where numbers stored on disk take up one byte per digit plus one for the decimal point, if any. (In RAM, integers are stored in two bytes while five are used for floating-point numbers. Unfortunately, there is no easy way of writing data to disk in this form.) There are two basic methods of inputting data from a disk record: GET# which fetches one character and INPUT# which reads until it reaches a carriage return — more than 80 characters in a field will give a 'STRING TOO LONG'

The good news for machine code freaks is that the 'TIM' monitor is unchanged; the bad news is that the second cassette buffer is no longer freely available. It appears that 40 bytes at the bottom are used by the disk commands, and 20 bytes just below the start of Basic are used for tabs and other, unidentified, purposes. Up to 80 horizontal tabs may be set by pressing shift-tab, but the same key combination is also used to clear them, so you must be careful. Unfortunately tabs do not affect a printer and pressing the tab key when past the last tab stop takes you to the end of that line, not to the first tab position on the next.

The most exciting new function must be the auto repeat on the cursor movement, INS/DEL and SPACE keys. All other keys will repeat when pressed in conjunction with the REPEAT key. Other screen handling functions allow you to insert or delete a line at the current cursor position, erase the current line up to or from the cursor and even scroll the screen up or down irrespective of the cursor position. Text editing is an obvious application for these new features, but no doubt programmers up and down the country will be frantically searching for others.

The facility that sets the 8032 apart from many other micros is its ability to restrict scrolling and all other screen functions to a rectangular 'window', the size and position of which is set by the user. Four locations in page zero are used to define it, and it's probably simpler to POKE these locations rather than move the cursor to the corners of the window and print the appropriate control characters. The window can be dismantled by pressing the HOME key twice in succession — something the programmer will have to trap. For some reason (a bug?) tabs included in the Basic statements are calculated not from the left margin of the window, but from the left of the full screen.

Even more mysterious is the 'STRING TOO LONG' error which appears only when the left margin of the window is set greater than 10, and the RETURN key is hit immediately after the CLEAR key.

The only criticism of the screen functions is that they're not readily available from the keyboard — they're generated by printing an appropriate reverse field

We Proudly Announce

The arrival in Australia of the new COMMODORE CBMtm 8000 SERIES BUSINESS COMPUTER and PERIPHERALS.

Yes it's here at last. First there was the PETtm, then the CBMtm 3000 Series and NOW the advanced CBMtm 8000 Series — all of which have proved extremely successful Overseas.

CBMtm 8000 SERIES BUSINESS COMPUTER — This new release offers a wide screen display to give you 25 80 character lines of information. Text editing and report formatting are faster and easier. The CBMtm 8000 also provides a resident Operating System with expanded function capabilities. BASIC can be used in both interactive and program modes with expanded commands and functions for arithmetic, editing and disk file management. An ideal Computer for any business.

CBMtm 8050 DUAL FLOPPY DISK UNIT — An enhanced version of the intelligent CBMtm 3040 Disk Drive which retains all the unique features of its predecessor. It provides more powerful software capabilities as well as nearly ONE MEGABYTE of on-line storage capacity. The CBMtm 8050 Disk Drive supplies relative record files and automatic diskette initialization, can copy all files from one diskette to another without copying unused space, has improved error recovery and the ability to append to sequential files.

Many more superior features have been incorporated into the COMMODORE CBMtm 8000 SERIES — too numerous to mention here.

Whatever your computing requirements, we now have the system to fulfil your needs. Come and talk to us today.

master charge
THE INTERBANK CARD
VISA

MICROCOMP
MICROCOMPUTER SYSTEMS DESIGNERS

B.S. MICROCOMP,
4th Floor,
561 Bourke Street,
MELBOURNE, 3000
Tel: 614 1433.
614 1551.

Attention computer users

Introducing the new 700 series Acoustic Modems

Electro Medical Engineering Pty Ltd proudly announce the release of their exciting new 700 Series of acoustic couplers. These low cost couplers are modular in design, simple to operate and offer unsurpassed performance even when both ends of the connection are acoustically coupled.

700 Series Originate Answer Acoustic Coupler

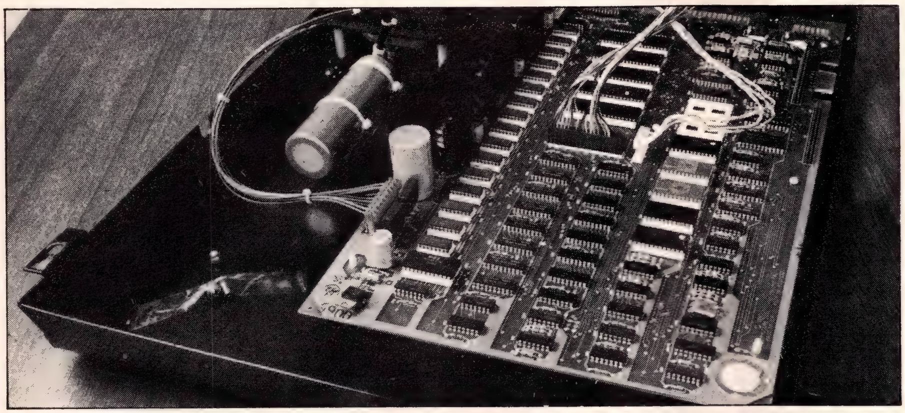
Operates at up to 300BPS Full or Half Duplex
Powered from the terminal or from a 9V plug pack
Suits all computers or terminals with RS232 compatability
Available with switch selectable answer/originate facility
1200BPS Half Duplex models also available
Communicate with others to exchange messages, programs etc.
Set up your own data base service.

The 700 Series can be ordered with an originate/answer facility that has been designed to surpass the requirements of telephone authorities around the world. Don't send overseas for acoustic couplers. They won't give reliable performance and you'll be disappointed. Sendata acoustic couplers will outperform all others and they are available here in Australia.

Electromeds eight years experience in the design and manufacture of acoustic couplers ensures premium performance.

For further information contact your local representative:-
VIC. A.D.E. (03) 543 2077. The Logic Shop (03) 51 1950 **NSW.** A.D.E. (02) 848 8533. The Logic Shop (02) 699 4910
QLD. A.D.E. (07) 350 2611: Management Technology (002) 34 4522 **ACT.** A.D.E. (060) 58 1811. Applied Data Control (08) 79 9211
WA W.J. Moncrieff (09) 325 5722.

ELECTRO-MED **ELECTRO-MEDICAL ENGINEERING P/L**
69 SUTHERLAND ROAD, ARMADALE, VICTORIA, 3143. AUSTRALIA. TELEPHONE: (03) 509 5844. TELEX: AA36384



character within quotes. However, because there is no key on the keyboard that will generate these characters directly, you must press the escape key (taking you out of the mode in which control characters are normally displayed), then REVERSE, then the appropriate letter — which may be shifted. No doubt it will seem very natural after a few years, but it would be so much easier if Commodore had provided a control key.

Returning now to the subject of garbage collection — one characteristic of Microsoft Basic is its dynamic storage of strings. Each time a string varaible is redefined it's rewritten elsewhere in memory, the previous representation becoming redundant. When the memory available for strings is exhausted, program execution halts while a 'garbage collection' routine disposes of the redundant strings and gathers together those that are still valid. At worst garbage collection now takes less than a second, against 20 minutes (in an extreme case) with earlier PET Basics. A slight disadvantage is that each string variable now takes up two additional bytes which are used for a vector pointing from the string storage area to the variable table. Each element in a string array now uses five bytes in addition to the length of the string, and for string variables the overhead is nine bytes. Another disadvantage is that creating a new non-array variable now takes up to half a second because the whole of the array table must be moved up — the secret is to mention each variable before setting up the arrays. String operations seem to be slightly faster overall by about 10%. However Benchmark timings, which don't test string handling, give identical timings to those for the new ROM PET.

Potential use

The CBM 8032 is a convenient computer, easily transportable and sturdy, the only essential add-on being the cassette deck or the disk drive. The Basic includes all the common mathematical functions and, while not as comprehensive as most disk Basics it is faster than average. The 80-column screen is ideal for business use and, though the 8032 may be more difficult to program than many machines, this will not affect the vast majority of business users as there are sure to be plenty of packages available.

Whether this new model will be bought for use in schools, colleges and the home is more questionable. The screen handling functions are impressive, but hard to use, and most of the graphics characters are inaccessible from the keyboard. The recommended price is $600 more than that of the 32k PET and more than twice that of an 8k machine with a built-in cassette. Commodore has aimed the 8000 series at the business market and it looks to have a good chance of achieving its objective. Because the 8032 is this year's model, a particular sector of the personal market will rush to buy but, at present prices, the existing range should have plenty of mileage left in it yet.

Compatibility

If you are thinking of upgrading from your existing PET, it won't be too difficult to modify existing software. Most of page zero is virtually unchanged and, while routines in ROM have been shuffled around, the majority perform exactly the same functions. Games programmers should note that the values stored in locations 151 and 166 have changed — they are no longer keyboard values, but garbled ASCII.

The 'window' facility makes it easy to simulate a 40-column screen, although programs that poke the screen will need changes as it now occupies RAM addresses 32768 to 34767.

Machine code programs that call Basic routines or use the second cassette buffer will need rewriting but most others will run without modification. The 'merge' technique can still be used to load subroutines or utility programs, although it founders if a line which lists more than 80 characters (including line number) is included.

To summarise, conversion of new ROM programs for the 8032 will be fairly easy, in many cases easier than converting between old and new ROM PETs.

Documentation

Two manuals were supplied with the review machine — a Users' Guide and a preliminary Basic/DOS manual. The users' guide is a good introduction to the mysteries of computer operation; as well as covering the physical controls, it describes all the command functions necessary for successful machine operation.

The preliminary manual was exactly that. Essentially written for Commodore dealers, it assumes a fair degree of prior knowledge. We hope that the version supplied to users of the 8032 is more comprehensive, though in this respect Commodore's track record is not enviable. Even this dealer's manual leaves out such useful information as the fact that auto-repeat can be disabled and that the length of the keyboard buffer can be altered. A good start, but serious programmers will need more, much more.

Conclusions

Commodore set out to widen its influence on the business market and without doubt it will succeed with the model 8032 which looks, feels and behaves like a business computer. Programmers used to the PET will find the 8032 an irritating machine to work with but no doubt they'll learn to love it. Let's face it — they'll have to.

The gaps in the memory map give hints of greater things to come — we hope it's not too long before Commodore extends the system software to make up for the odd weaknesses in the present version.

Finally, whether or not you're a businessman, if you require a display of more than 40 columns then you must put the 8032 on your shortlist of possible machines.

Memory map

FFFF	Basic + OS
B000	ROM expansion
9000	Unused
8800	Screen RAM
8000	User RAM
0400	
0000	Basic RAM

Benchtest timings (in seconds)

BM1	1.7
BM2	10.0
BM3	18.4
BM4	20.3
BM5	21.9
BM6	32.4
BM7	51.0
BM8	11.9

At a glance

FIRST IMPRESSIONS	
Looks	****
Setting up	*****
Ease of use	*****
HIGH LEVEL LANGUAGES	
Basic	***
Pascal	***
PACKAGES	Being planned
PERFORMANCE	
Processor	***
Cassette	****
Disk	***
EXPANSION	
Memory	*
Cassettes	****
Disk	*
Bus	****
COMPATABILITY	
Hardware	*
Software	**
DOCUMENTATION	***
VALUE FOR MONEY	***

*****	excellent
****	v. good
***	good
**	fair
*	poor

NEW FROM COMMODORE

CBM 8032
18K ROM, 32K RAM, 80 character x 25 line screen, extra commands and scrolling windows are just a few of the new features.

CBM 8050
1 Megabyte dual 5¼" intelligent disk drive.

CBM 8024
132 Column, 160 cps, intelligent dot matrix bi-directional printer.

PET 2001
14K ROM, 8K RAM (RAM expandable to 40K) PET now comes with the same logic board as our professional 3000 series, including NEW ROM to allow use of disk drives, printers etc. without need for any 'expansion' kits.

PET FOOD OF THE MONTH . . . VISICALC — NEW FOR THE 8000 SERIES

Adventure	$15.00	Space Shuttle	$14.00	Aircraft Lander	$45.00
Batman	$15.00	Personality Test	$14.00	6502 Assembler Tutorial	$77.00
Bomber	$15.00	Diagnostic	$22.00	Talking Calculator	$31.00
Brands Hatch	$19.00	Micro Pools Pack	$61.00	Course Handler	$260.00

WRITE FOR OUR SOFTWARE & ACCESSORIES LISTS FOR YOUR PET: PRICES INCLUDE DELIVERY

EDIBLE ELECTRONICS

bankcard welcome here

50 PARK STREET, ABBOTSFORD, VIC. 3067 PH. (03) 41 5708

LOOKY VIDEO

INDEPENDENT IMPORTERS/ MANUFACTURER

OHIO SCIENTIFIC COMPUTERS HARDWARE

1. MEMORY EXPANSION BOARD, 8K. The Double sided Plated through the Board has 8K of wired sockets with driver and buffer I.C.'s and R.F. filters. Add 2114's as you require RAM KIT. $120.00
Fully assembled and tested, extra. . . $15.00
2. New EPROM — Single key Basic and (10 lines) wording cursor control . . . $54.95
3. R.F. Modular, 5 to 9 Volt, all channels $19.95
4. SUPERBOARD II Cover/VDU Stand $18.95
5. SUPERBOARD II COMPUTER 8K ROM, 4K RAM $389
6. CHALLENGE C1P COMPUTER 8K, ROM, 4K RAM. $489
7. CHALLENGER C4P COMPUTER "Sound NTSC Color" $946.20
Available soon — P.A.L. conversion. . $80.00

FROM 1st SEPTEMBER ASK FOR NEW PRICE LIST.

NEW PROGRAMMES for OHIO — SOFTWARE

More new lines of software available — enquire.

UTILITIES:

U.16. Filename, for cassettes	$8.95
U.17. Trace	$11.95
U.18. Packer — (K saver)	$14.95
U.19. Cursor — C2/4	$11.95
U.20. Mini Assembler	$9.95

INSTRUCTIONS:

I.11. Disassembled ROM, with comments	$12.95
I.12. 32x64 Character Display	$12.95
I.15. Sound Port SII/CIP	$6.95
I.16. G.T. Conversion, X2	$2.95
I.17. Saving Data on Tape	$6.95
I.18. CIP Tape Control	$6.95
I.20. CIP/Base 2 Printer	$6.95
I.21. Morse Code Converter & Tape	$16.95
I.22. 32x64 Character Supplement to I.12. 100% hardware Method	$4.95

bankcard welcome here

GAMES:

G.28. Death Ship, 2 tapes	$18.95
G.29. Startrek	$9.95
G.30. Air Sea Battle	$9.95
G.31. Cannoneers	$9.95
G.33. Grand Prix	$9.95
G.35. Avalanche	$9.95

BOOKS/MAGAZINES/CATALOGUE

T.1. The First Book of OSI	$16.95
T.2. Aardvark Journal (6 issue)	$10.95
T.3. Basic Handbook, David Lien	$15.95
K.2. The First 100 items of Software (catalogue)	$3.50 plus $1.00 P&P

also
NOW AVAILABLE blank DIGITAL tapes C-10 . . . . $1.85 less for lots of 10 or 100.

Postage:

1 or 2 $1.00	3 — 5 $1.50
6 — 9 $2.00	10 or more $2.50

All prices are subject to change without notice.

All prices INCLUDE Sales Tax.

MAIL ORDER: Bankcard or Cheque

LOOKY VIDEO,
P.O. Box 347, Richmond, 3121, Victoria.
418 Bridge Rd, Richmond. Tel.(03) 429 5674

NEW! Apple® software from Micro-Educational

Looking for software that works?
Try micro-Educational. We're very selective about what we sell. We like the repeat business. Our catalogue represents the 'top 5%' of US and Australian software. Here is a sample:

Classroom computer package # 1. A complete curriculum authorising system on 2 disks. Spectacular animated graphics, sound and tutorials. 16 page manual. 48K disk. $55.00

Milliken maths strands. A maths skills curriculum from Milliken Publishing. 12 disks. 650 levels. 1st to 6th grade. 16 colour graphics. Extensively researched and professionally presented. 32K disk. $325.00

CONFLICT. Roger Keating's classic intelligent wargame. Real time action with the challenge of chess. Spectacular graphics. 32K disk or cassette. $25.

Interested? Here's the coupon. (P.S. If you're quick we might even tell you where to buy cheap disks.)

- -

Yes, I'm tired of buying junk software. Please send me your catalogue of the best US and Australian software.

Name ....

Address .... Postcode ....

Post now to:
MICRO-EDUCATIONAL, 17 Park Road, Garden Suburb, N.S.W. 2288 Australia
SPECIALISTS IN CAI, EDUCATION AND ADMINISTRATION SOFTWARE

VISA

Our resident micro chess expert Kevin O'Connell reports on an interesting chess contest with a difference — it's one that's being fought out in the law courts.

WHO'S KING?

The strongest chess playing program currently on the market is that produced by the husband and wife team of Dan and Kathe Spracklen. The program is 'Sargon 2.5' or, alternatively, 'Boris 2.5'; they're identical except that Sargon is manufactured by Applied Concepts Inc. of Texas and marketed by Chafitz Inc of Maryland, while Boris is both manufactured and marketed by Applied Concepts. A little disagreement between the two companies has given rise to the two names and at least one lawsuit that's reputed to involve around 12 megabucks.

Applied Concepts, who have registered 'Boris' as their trademark, use the advertising slogan 'Boris is King', while 'Sargon', for those of you who have forgotten more Assyrian and Babylonian than you ever learned, means 'Declared King'. The direct line of descent, incidentally, is: Sargon I (ca 3000 BC), Sargon II (722-705 BC) and Sargon 2.5 (1979 –). One more juicy palace intrigue before looking at the program: the Spracklens were made a rather tempting offer by Fidelity Electronics (manufacturers of the Chess Challenger range) to commit infanticide and join the forces of the vociferous young pretender to the throne.

Boris 2.5/Sargon 2.5 usually comes in the form of a module for the Applied Concepts/Chafitz Modular Game System. Before I go any further along this treacherous path I propose to adopt the following terminology: Sargon for the program and Applied Concepts for the manufacturer/marketer.

The concept of a modular system is basically a good one. The idea is that when the program is improved, you can simply buy a new module rather than a whole new machine. However, it's somewhat doubtful whether any significant increase in playing strength can be effected with 8k of ROM and 1k of RAM. If you increase the amount of RAM you can certainly achieve more. The trouble with that, though, is that you may be left in the somewhat unhappy position of keeping the 8k ROM module and buying a new system to plug it into! Nevertheless Mr. Terry Knight has the novel idea of an 8K module to play the opening, then another to handle the middlegame and, finally, almost 8k of look-up tables to play a formidable endgame.

Sargon is one of the very few machines to have established a significant track record in competitions. Way back in March 1978 an early version won the first ever microcomputer chess tournament in San Jose, California, with a clean score, finishing ahead of the Commodore Chessmate, Boris and Chess Challenger – all of whom tied for second place. In the 1978 North American Computer Championship Sargon II finished third behind two monsters: Belle and Chess 4.7. Last year the upgraded version, Sargon 3, won the Personal Computer World tournament in England with a clean score and placed 7th equal in the North American Computer Championship. That same year it also played in a tournament that was basically for humans in the Paul Masson vineyards in California. The program, unaffected by the vinous surroundings, made a plus score and achieved an official rating of 1641 (playing on its level 4).

There is a worldwide rating system for chess players: Here are a few figures to help put Sargon in perspective. The reigning world championships are: Anatoly Karpov (human) 2725, Maya Chiburdanidze (human, female) 2400, Yasser Seirawan (human, junior) 2510, Chess 4.6 (Computer) 2100. A rating of 2200 indicates master level. Sargon currently rates about the same as a moderately good club player.

Sargon has seven levels of play, five of which have a reasonable average response time: level 0 (instant response), level 1 (10 seconds), level 2 (20 seconds), level 3 (45 seconds), level 4 (2 minutes). In play it can seem to respond even more quickly because the program, having played its move continues to analyse a tree based on what it considers to be the most likely reply by the opponent.

Sargon's playing strength vis-a-vis the other good chess machines on the market can be judged from its 10–7 victory over Chess Champion System III which in turn defeated the Voice Challenger by 10–7. If you are one of the very few thousand serious chess players in this country, playing regularly in club and tournament competition, then at the moment Sargon may be the only program to offer you stiff enough opposition.

The basic operation of Sargon is easy enough in its game playing mode and setting up a position is also quite straightforward. There is a 'restore' key which enables you to take back up to six ply (three moves for each side), two ply at a time, but you can never restore back to the original position. Thus, if you are anxious to play a particular opening, you have to run through the laborious process of switching the machine off and on, each time waiting while 'Sargon awaits your move' scrolls across the display and hoping all the while to achieve the opening of your choice.

There is one thing about Sargon 2.5 which I hate – the 60-odd (or 60 odd) messages which appear on the display from time to time. They range from the sublime ('woops') to the ridiculous ('are there ladies present?'). Apparently customers are about equally divided in liking or disliking them. However, it seems to me to be simply a waste of about 1k of ROM and an unforgivable mistake on the designer's part that you cannot exclude them, even if you want to.

As an alternative to the Sargon 2.5, you can get a slightly weaker version of the program, for about $19, in the form of *Sargon, A Computer Chess Program* by Dan and Kathe Spracklen, published by Hayden (Australian distributor – Butterworth). Of course, for this version you will need a few other things: some time, a steady typing speed and a system that uses Z80 assembler, (minimum 8k RAM). Preferably your Reset button will be safely mounted at the back of your system, if not then allow lots of time for keying in!

There is also a more expensive ready-made version, with an 'auto response board'. If money means nothing to you, then take a look at it; the craftsmanship of the inlaid wooden board is superb. This version has another great asset: since it has no display (moves are indicated by LEDs inset into the 64 squares) the comments have been excluded and replaced, I am told, by extra openings.

First Computer World Chess champion

No, it has not happened yet, but the Fredkin Foundation of Cambridge Massachusetts, recently offered a $100,000 prize for the first computer program to win the world chess championship.

While programmers continue to strive for world-class chess skill in their programs, the Fredkin Foundation is offering a series of incentive prizes for computer-against human competition. Two human players of a specified skill level will be selected each year to play the two top programs. Each will play a two-game match, winner take all. The first competition will take place this November at Carnegie-Mellon University; the prizes will be $1500 and $1000. In each succeeding year, stronger humans will be selected and the prizes will be increased.

When asked what players should do, in general, to improve their play, the world champion, Anatoly Karpov, replied, "Endgames, study endgames". That is good advice for chess programmers too, but my advice to Karpov is – computers, study computers!

BASIC BASIC

The problem with Basic is that there are so many mutually incompatible versions around that transferring a program from one machine to another can often be quite difficult. Mike Parr suggests a way of presenting programs so that they can be easily implemented by users of any machine.

Welcome to the world of 'Microsoft' Basic! On flicking through the pages of APC you've probably seen many systems which claim to run a version of Microsoft Basic – e.g. Tandy Level II, PET, CP–4P, and Sorcerer. You could be forgiven for thinking that programs are easily transferred between these machines. The fact is though that a considerable amount of rewriting may be required. For example:

```
10 IF A=B THEN X=INSTR(L$,"A")
ELSE GOTO 50
```

will happily run on a Tandy but not, for example, on a PET. The latter machine cannot handle either the ELSE or the INSTR functions.

Bearing in mind that an APC program might be typed in and edited by people as diverse as typists, businessmen or teachers then the problem of compatibility is a major one. There have been various approaches aimed at facilitating program 'portability', including the use of a 'universal' assembler-type language, which is easy to adapt for any machine, and even rigorous high-level language definition, such as Algol 68. It would be nice to say that Pascal allows machine-independent software but, even here, it seems that dialects are going to differ. Already we see Transam and USCD compilers being based on different standards.

However, all is not lost – the different versions of Microsoft Basic are sufficiently similar to enable you, with a bit of care, to write programs that run on any system with little or no modification.

There are four main areas where portability problems occur – statements, data types, functions and input/output. I shall now examine each of these in turn.

Statements

The following statements occur in almost all Microsoft implementations: GOTO, IF . . .THEN, END, STOP, LET (or just plain =), FOR . . .TO. . . STEP, NEXT, DEF FN (numeric only), DIM, REM, GOSUB, RETURN, PRINT, INPUT, READ, DATA, RESTORE, CLEAR, ON. . .GOTO, ON. . . GOSUB and, finally, a colon may be used to separate statements.

It's clear that you can achieve maximum program portability by restricting your published programs to the above Microsoft subset. It will, of course, mean that some of your routines may not be as elegant as you might like but then again it does ensure that your efforts reach as wide an audience as possible.

Before moving on to data types I shall illustrate a few of the more common Basic functions which I have had to leave out of the subset:

```
10 IF A=B THEN PRINT C ELSE STOP
20 IF C=D, PRINT E
```

LINEINPUT, which reads a complete line of text, including spaces, commas and quotes into a single string variable. Believe it or not, this too is absent from many systems.

File OPEN and CLOSE is missing as well, because some systems don't have data files, and PEEK, POKE and USR are definitely out of the question as they are the very essence of machine dependency. Finally, CLEAR is similar on most machines but not identical, so it must also be banned.

Apart from the statements themselves there's the question of line lengths. Tandy for example is 64 characters, while Superboard is 71 (yes, 71!) and PET is 80.

The moral is clear . . . when it comes to statements keep the lines short and work as far as possible within the subset.

Data types

The second aspect of portability concerns data types. Microsoft Basic includes floating point numbers, strings of up to 255 characters, arrays of either type with no limit on the number of elements or dimensions and where only the first two letters of a variable name are significant.

On some systems, other variable types are allowed. An integer, for example, is sometimes defined by following its name with a % character thus:

```
20 I%=I%–1
```

Tandy has a more powerful system, including a set of statements like DEFINT I–N, which automatically causes all variables starting with the letters I to N to be treated as integers. In many programs, leaving out any special integer use has no serious effect (unless memory happens to be very tight). Finally, I should mention accuracy. Most hobbyist programs don't rely on high numerical accuracy, which is just as well since many systems have only 6 or 7 digits of precision. In general I would suggest that you stick to single precision floating point numbers unless memory size and arithmetic precision are particularly important to your application.

Input/Output

The remaining (and most involved) area deals with data-file I/O and memory-mapped graphics. The suggested approach is to use subroutines for primitive functions, commented in such a way that the average user (given reasonable system documentation) can amend them to fit any computer. As an example, consider memory-mapped graphics, instead of just writing:

```
10 POKE 16300+Y*40+X, 65
```

you could write:

```
10 C=65 : GOSUB 2000
```

then:

```
2000 REM PLOT CHAR C AT X, Y;
(0,0 IS TOP LEFT)
2010 POKE 16300+Y*40+X,C
2030 RETURN
```

. . . with the result that the user only needs to alter the subroutine, not dozens of POKEs throughout the program. Ideally you would also incorporate checks on the ranges of X and Y, as screen sizes vary between machines.

Looking now at file I/O, PET and Tandy users may be amazed to learn that many systems have no provision for cassette data files, other than resorting to PEEK, POKE and USR facilities. On most disk systems however, typical statements are:
ASC, CHR$, LEFT$, LEN, MID$, RIGHT$, STR$, VAL.

The main omission here is the useful

INSTR string searching function, which is missing from many systems. For complete compatibility, one can use a subroutine which performs a similar function (albeit slower) but, if you must use it, avoid the nested form:

```
10  A$=LEFT$(L$,INSTR(L$,  “A”))
```

as the PET user may be replacing INSTR by GOSUB, and would prefer:

```
10 P=INSTR(L$, “A”)
20 A$=LEFT$(L$, P)
```

this being much easier to edit.

Finally, most systems include the FRE function, used with either a numeric or string argument. This is fine, but bear in mind that, as with CLEAR, certain assumptions about free space may be machine-dependent (for example, one might use FRE to determine the maximum subscript for a numeric array – however, don't assume that all systems use the same number of bytes to store each array element).

Standard Functions

All Microsoft systems have these numeric functions:
ABS, ATN, COS, EXP, INT, LOG, RND, SGN, SIN, SQR, TAN, TAB.

They also have the logical functions (actually operators) of AND, OR and NOT which treat their operands as 16-bit two's complement integers. The 16-bit number, consisting of all ones, is regarded as logical TRUE, (its value being –1).

The only major difference between the built-in functions concerns RND. Most machines will produce a value between 0 and 1 whereas Tandy, for example, will give a value between 1 and n. To make such a program more portable, you should only assume the presence of random numbers from 0 to 1, and modify the result using a scale factor and the INT function.

Character functions include:
OPEN, CLOSE, PRINT 1, INPUT 1, LINEINPUT 1

. . . together with the EOF(N) function, which returns a 'true' value if there is no more information in file number N. As an example, one could list a file on the VDU by:

```
10 REM OPEN FILE CALLED HIM
FOR INPUT AS UNIT 1
20 OPEN “JIM”, I, 1
30 IF EOF (1) THEN CLOSE 1: END
40 LINEINPUT   1, L$:PRINT L$:
GOTO 30
```

In fact, very few cassette systems could handle this (reasonable) program. PET and Tandy machines, for example, have no LINEINPUT and the Sorcerer can't even read text from tape, as data is only allowed to be in the form of numeric arrays.

A further problem exists concerning motor control. Examining cassette handling on 'good' systems such as PET and Tandy, one sees that the task of tape I/O consists of:

Output	Input
Start motor	Start motor
Wait (and transmit 'null' chars.)	Ignore 'null' characters.
Transmit line.	Read line.
Stop Motor.	Stop motor.

On a machine with no cassette motor control, problems will arise when trying to run this type of program:

1. Read data from tape.
2. Process data.
3. Goto step 1.

If step 2 involves lengthy calculations, the cassette (which is still running) may be in the middle of the next data line before the program is ready to read from it. Once again, the approach to take is to write all machine-dependent software in commented subroutines, which provide the primitive operations of reading and writing complete lines of text. Output is straightforward, except for the proviso that, if no motor control exists, sufficient 'null' characters must be used to enable the program that will eventually use the data to "keep up":

```
4000 REM. L$ TO FILE
4010 PRINT  1, L$
4020 RETURN
```

The Superboard user, for example, may replace this by a routine to transmit 'null' characters for a second or two, then to transmit L$ character by character.

The file input routine is the equivalent of:

```
5000 REM. READ LINE TO L$
5010 LINEINPUT  1,L$
5020 RETURN
```

. . . where the Tandy user may replace 5010 by a loop using INSTR$ to build up L$, and Sorcerer users might use CLOAD, converting the input numeric array to a character string in L$. Obviously, the input and output routines should be compatible in the sense that strings transmitted to and read back from file should appear identical.

Additionally, one requires an end-of-file test, and an easy machine-dependent solution is to denote the end with a special peculiar line such as "/+/+". If this is adopted, the EOF () function is not required, and the 'higher-level' input routine becomes:

```
6000 REM LINE TO L$. SET EF TO
– 1 ON EOF
6010 EF=0: GOSUB 5000
6020 IF L$=“/+/+” THEN EF= –1
6030 RETURN
```

To complete the I/O routines, we require open and close facilities for our files:

```
7000 REM. OPEN OUTPUT FILE
7010 PRINT“PRESS RECORD AND
PLAY, THEN ENTER ANY CHARAC-
TER”: INPUT L$
7020 RETURN
8000 RETURN
8000 REM. OPEN INPUT FILE
8010 PRINT “PRESS PLAY, THEN
ENTER ANY CHARACTER”: INPUT
L$
8020 RETURN
```

(if you have an 'open' statement, insert it at 7005 and 8005)

```
9000 REM. CLOSE INPUT FILE
9010 RETURN
```

CLOSE may be inserted at 9005)

```
1000 REM. CLOSE OUTPUT FILE
10010 L$=“/+/+”: GOSUB 4000
10020 RETURN
```

(Again, if you have a CLOSE, place it at 10015)

These routines assume no named files – though modification would be trivial if you have such luxuries – and one file device only (a cassette deck perhaps). In common with the 'subset' approach, only the minimum facilities are assumed.

To summarise I/O, the benefits of this method appear when you attempt to transfer programs between machines with widely differing I/O methods. Finally, if you think that these routines preclude numeric I/O, it's no trouble to use the built-in conversion functions, so instead of:

```
10 PRINT  1, N
```

you may write:

```
10 L$=VAL$(N): GOSUB 4000
```

Conclusions

With a little forethought and a bit more typing, portable software is possible. It must be admitted that some defy portability – some flashy graphics could give problems, and memory size may be significant in large programs. However, there's no reason why the remainder should not see much wider use once a Microsoft subset has been followed.

Example

To illustrate what I mean here's a useful example that conforms as near as possible to the 'rules' that I've proposed. The program is an interactive data-file editor for any single-cassette system, illustrating the use of a subset, and the file I/O routines. The data lines are read into a large text array T$(), and may then be edited by the following commands, typed in response to "C?".

Back – by a specified number of lines.
Forwards – by a specified number of lines.
List – as Forwards, but display lines.
Delete – delete current line, and move to next one.
Insert – insert a new line after the current one.
Replace – replace the current line by a new line.
SAVE – save the edited text on cassette.
Search – search for a line containing a specified string.
Top – move back to 'top' of file.

(Only the initial, capital letters of the command should be used.) The commands relate to the current line, usually the last line displayed. e.g. to move forward 3 lines:

F is typed in response to C?
FOR? is printed by the program.
3 is entered by user.

To actually use the program, load it from its own cassette, then place the data tape in the recorder, ensuring that it is rewound. Type "Y" in response to the 'existing file' question, and perform the edits. Before typing SAVE, either rewind the data tape, or load a fresh one (thus giving you a back-up copy). To create a new file, type "N" instead of "Y".

The program occupies around 2200 bytes thus leaving, in an 8k system, some 6000 bytes for text (about 200 lines of 30 characters). On your system, alter line 20 to clear your maximum string space, estimate your average line length, and dimension T$() to the maximum possible number of lines.

If your data doesn't have commas or leading spaces, INPUT 1 can be used in place of LINEINPUT 1. For those with no cassette motor control, only a very short delay is needed in routine 8000, as the lines are rapidly read and stored in T$(). In fact, the cassette control on the Tandy, involving a delay of several seconds, is a disadvantage in this type of input.

GOTO page 56 for Listing

PERSONAL OPINION

by Bob Pacsoe.

R.S.V. Pascoe is a lecturer in Computer Science at the Royal Melbourne Institute of Technology, where he lectures on Compiler Design & Programming Methodology. He is also an industrial consultant on programming languages and an active programmer.

Many if not most, of the readers of APC are likely to be fairly good programmers in one language – Basic. Well that's unfortunate! The era of the new languages, such as Pascal, is with us. And, like it or not, if your only expertise is Basic, then you may as well forget computing and take up mushroom farming. The new breed of whiz kids, with their data structures, recursion and structured code, are going to walk all over you".

Still reading? Good! A little hot under the collar? Excellent! What a way to start a column – by insulting most readers so that they "switch-off" and don't read any more. Thanks for staying this far!

What I would like to talk about here is this well known hot-head reaction of programmers to 'new languages' – whether Basic versus the 'new' Pascal, or Pascal versus the new ADA, or whatever. Why do we all get so defensive?

To answer this, we must look at what motivates people to write computer programs. Some people, the professional and the entrepreneur hobbyist, are in it for money, or, at least, for the promise of money. Some people program computers because they really do need to use them to assist in their business or research.

But it seems to me that these motivations are really only peripheral to the underlying psychology of programming. In a fairly long history of working as a programmer and with other programmers, I have never yet failed to study the way a programmer reacts to his finished product. And it's always the same. Some manifestation of pride – some interpretation which says 'look I've done it – I've thought and thought, I've battled, and I've produced a working creation of pure logic'.

Many times I've watched people who have just completed long programming projects – some go to the Pub and get drunk, some make themselves unpopular by relating endless details of their creation to everyone in sight, and some just smile quietly to themselves and go about their business. But they all feel the same.

Some – the more experienced and more mature programmers; the sort of person I dearly love to have on a programming team – mix an element of remorse with their end of job pride. They know that all large programs are compromises, that given the job over again they could have done it more elegantly. They come out of their job as better human beings, more able and more determined to put a little extra thought into their next job. These people are often the 'super programmers' of the industry. They lie at the opposite end of the spectrum to the so-called 'Gee Whiz' programmer.

Well for the moment let's acknowledge the existence of the 'pride factor', and see why people are so defensive about their programming style, and their programming language.

It all comes back on where we hang our hats – that is, being able to explain exactly what our expertise is.

A great racing car driver rides his car through a turn like his ancestors rode their horses. A superb skier goes down a difficult slope with his skis 'glued together'. But what of we humble programmers? Can we dare say we are experts in problem solving? We could and we should – but we usually don't. Instead, we try to find something more concrete. And the language we use usually ends up as the scapegoat. We are experts in Basic or Fortran or assembler. What a lot of rot! We are experts in problem solving, and the language is our tool.

Let's say Basic is our claimed area of expertise. When we talk Basic we feel comfortable, at ease, secure. But when someone mentions Pascal we enter unfamiliar territory, we feel insecure. And we will probably react, naturally but unfortunately, by brushing the intruder aside. It is a natural defense mechanism which protects our pride. All this would disappear if we saw languages in their proper prospective as tools. A new language should be no more threat to us than a new style of disk unit! The problem is far worse in industry of course where programming managers may see their 'domination' of their staff as coming from their expertise in an old language. Huge computer users have been frozen in their techniques by attitudes such as this. The costs are enormous.

Of course, some tools are better than others. I, for one, firmly believe that Pascal and its sister languages are far stronger and more reliable tools to aid us in the production of programs than, say, Basic. But Basic, by virtue of the open availability of compilers and Basic programs generally, is still the major choice of the personal computer fraternity. And this choice is not necessarily an invalid one, although I believe that Pascal will eventually replace Basic as it becomes more readily available, and user expertise grows.

Incidentally, from the Computer Science Viewpoint (the theory of machines; the world of Turing Machines and Pushdown Automata) all languages which possess the rudiments of at least an IF statement and a GOTO statement are equally powerful. That is, a problem which is 'computable' in one language is also 'computable' in any other. But the amount of effort required to produce a solution, as well as the reliability of that solution, will certainly vary with the language used. What is a "reliable" program? What is a "good" program? That I would like to consider in two months' time.

Next month I will look at high level languages and their implementation requirements. In particular, the new breed of 16-bit fellows, such as Zilog's Z8000, and the Motorola 68000 seems to be designed to support high level languages. What's it all about? and when will they be available to the hobbyist? – in next month's issue.

MS Microsoftware

TAPE 2 LEVEL 2

Investment, future value regular deposits; regular withdrawals, initial minimum (for withdrawals); nominal interest, effective & earned-interest; depreciation rate, amount depreciation; salvage value; discount commercial paper; loan principal, regular and last payment, remaining balance, term-loan; mortgage amortization; greatest common denom. - integer prime factors; polygon area; triangle parts; analysis, operations two vectors; radian-degree., degree-radian conversion; co-ordinate, polar equation, functions plot; linear, curvilinear interpolation; Simpson's & trapezoidal rules, Gaussian quadrature integration; derivative.

Side 2 – quadratic equation, polynominal (Newton) & half inteval-search roots; trig. polynominal; simultaneous equations; linear programming; matrix addition, subtraction; scalar multiplication, inversion; permutations & combinations; Mann-Whitney U test; mean, variance, standard deviation; geometric mean & deviation; binomial, Poisson normal, Chi-square distribution; Chi-sq., student's T distribution test; F-distribution; linear correlation coefficient; linear, multiple-linear, Nth order, geometric, exponential regression; system reliability; future projections; Federal withholding taxes: tax depreciation schedule: check writer; recipe cost; map check; day of week; days between two dates; anglo to metric; alphabetize.

TAPE 5 LEVEL 2

Memory test, mortgage payments, tension breaker, lineprinter-screen & vice-versa utilites, Federal income tax, election returns, business percentage, vacation planner, car pool (disk), diet planning 2, mailing list (disk) and first aid.

Also spelling bee, Star Trek 3, mind bender, tachistoscope, chase, common factor, klingon capture, spelling practice, Hamurabi, animals, Snoopy, cryptogram, starship, ants, Yesterday, and Pilot (disk). Pilot is the language of computer-aided instruction (CAI).

TAPE 7 LEVEL 2

Disassembler, Pilot, roster, dropout, memory loader, memory sort, inventory control, graph, land surveying, mixed monthly sales report, shopping list, diet planning 3, loan progress chart, hexdecimal conversion.

Also Star Trek 4, states and capitals, battleships 2, spelling practice 2, number guessing, hangman 2, snark, slot machine, cipher, target, surround, adder, termites, lunar lander, multiplication exercise, five-in-a-row, Bastem, and write. A number after a program indicates there are other similar People's Software programs. Pilot is the same as the disk pilot on tape 5, except runs on 16K tape systems.

Each Tape $9.90 (incl. postage within Australia)

Please mail your order to:

MS Microsoftware,
P.O. Box 119, Essendon, Victoria, 3040.

SAVE US!

APC's reply to the recent wave of DIY Atomic Bomb articles (courtesy of Consolidated Marketing Corporation): extracts from a patent recently taken out in Great Britain.

(71) I, ARTHUR PAUL PEDRICK, British subject, of 77, Hillfield Road, Selsey, Sussex, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:–

This invention is concerned with creating underground shelters for protection against an attack by *H* bomb carrying inter-continental-ballistic-missiles.

In the accompanying drawings . . .

Figures 1 to 4 show various stages in the construction of an underground shelter against bombardment by *H* bomb carrying ICBM missiles, by exploding underground, a bomb, and Figure 3 shows the form of the *H* Bomb shelter as a completed structure.

Figures 1 to 3 show the successive stages by which an *H* Bomb shelter may be created by exploding a bomb underground.

As in figure 1, the bomb, given a sharply coned base, is driven down into the ground at the base of tube *T* of steel of substantial thickness by pile driving in well known manner.

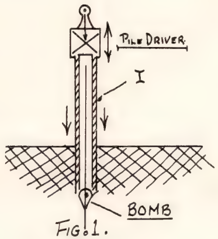
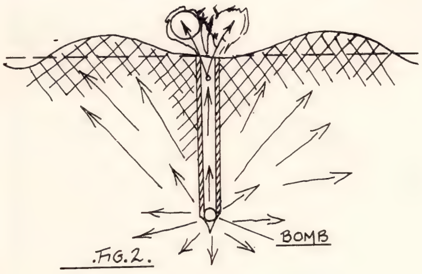


FIG. 1.

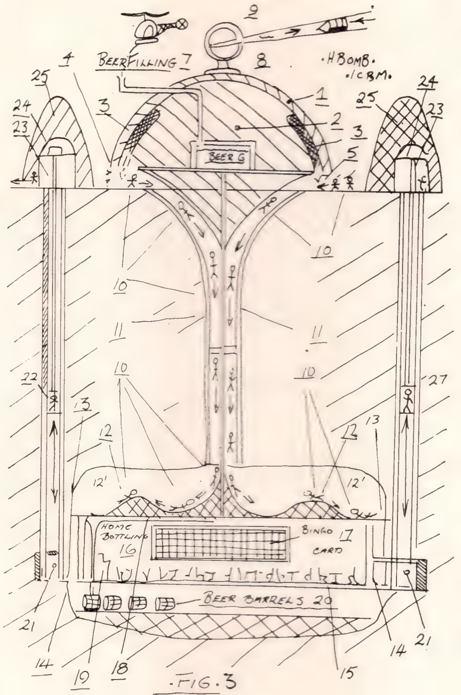
Figure 2 shows how, when the bomb is detonated, the shock of the explosion goes mainly down and around the outside of the tube *T* to create a crater, but part of the shock waves are used to drive material out of the tube *T*.



.FIG. 2.

Figure 3 shows a schematic view, as a vertical cross section, of a completed *H* bomb shelter, as developed from a crater originally excavated by the explosion of a bomb.

An upper shell of very strong, thick, steel, proof against the blast from a near miss *H* bomb encloses a radiation shield of concrete *2,* and two slidable doors or shutters *3* which can be released, to seal off the entry area *4* and *5*, for World citizens, *10,* wishing to escape from the *H* bomb ICBM attack. Within the shell *1* is a reservoir for beer *6*, which can be filled from a filling funnel *7* by a beer carrying helicopter.



·FIG·3

The shell *1* carries, at its top, a radar bowl and aerial *8-9,* to give as long a warning as possible of approaching *H* bomb carrying ICBMs.

The radar assembly *8-9,* activates an alarm hooter and World citizens, *10,* make a rush through the entrances *4* and *5,* and, on their bottoms, are accelerated by gravity at about 32 feet/sec², until they are falling freely down the central shaft *11,* which, if deep enough, may enable them to attain a terminal velocity of about 150 mph.

When the approaching *H* Bomb carrying ICBM missile has about 10 seconds of flight left, the radar assembly *8-9* triggers a mechanism to release the slidable sealing doors *3,* light beam photocells devices being used, not shown, to ensure they do not fall on a World citizen *10,* who is a bit late reaching the shelter, due to old age or rheumatism, after which the shell *1* and its beer supply, is effectively sealed off from the *H* Bomb attack.

World citizens *10,* after a free fall down the shaft, *11* landed on their bottoms, on a switch back system *12* of retardation high friction surface tracks, which slows them up so that their feet ultimately compress springs *12*, and they are brought to a halt.

The World citizens *10* then get to their feet, and descend ladders *14* to the Cafeteria and Bingo Hall on floor *15,* and, if they wish, can take part in a Bingo Session using the Electronic Bingo Master Card, *17,* on the wall. Refreshments, of a liquid character, may be obtained from the bar *19,* from beer sucked up from barrels *20* in the cellar below, supplied through a pipe *18* from the gravity tank *6* in the shell *1.*

When the ICBM attack is over, World citizens *10* can, through access ways *21,* take lifts *22*, operated by lift machinery *24* in *H* bomb proof shelters *25,* to the access ways *23,* and have a look at the "World", to decide whether it is reasonably safe for them to resume their previous activities, or they may decide they will return down the lifts to have another Bingo session, to let the level of radioactivity die down a little.

Figures A and B, of the drawings, show how the speed of descent of World citizens dropping down shafts leading to an *H* bomb shelter, created by exploding a Bomb, or down a tubular escape shaft forming part of an escape system from a conventional fire, can be retarded by making the tubes just larger than an ordinary umbrella, and the World Citizens can use such, or a specially provided small parachute, which they can clip on quickly, to provide aerodynamic braking of their descent.

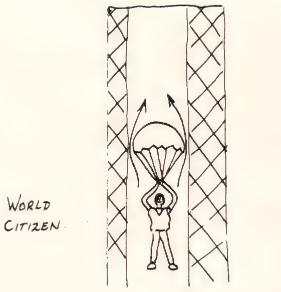


FIG A + B.

WHAT I CLAIM IS:–

1. An arrangement for protecting "World Citizens" from accidental, or deliberate, attack by *H* Bomb carrying Inter Continental Ballistic Missiles, in which a deep underground shelter is created by the detonation, at a suitable depth, of a Bomb, the crater produced in this manner being provided with suitable facilities for recreative activity and liquid refreshment, a single central vertical shaft being provided between the surface of the ground beneath an *H* Bomb proof shield, and the crater shelter space, down which it is possible for "World Citizens" to fall freely under the influence of gravity, and lift shafts for them to return to the surface of the ground, after the completion of the accidental, or deliberate, attack by *H* Bomb carrying Intercontinental Ballistic Missiles.

Australia's first under $300 COMPUTER...

$295
INCL. ZX80 BASIC MANUAL

Remember — *all prices shown include sales tax, postage and packing.*
N.B. Your Sinclair ZX80 may qualify as a business expense.

sinclair ZX80 -British made.

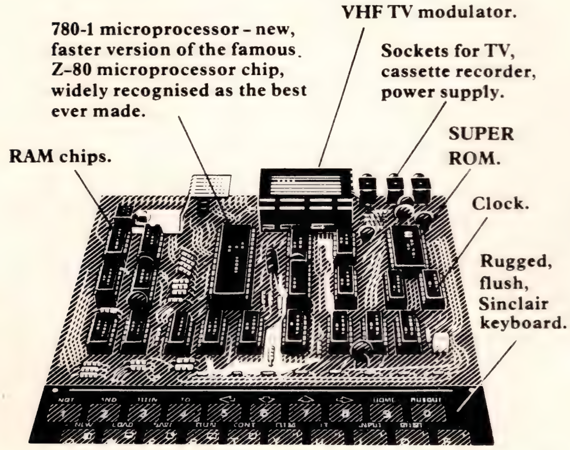
Until now, building your own computer could cost you around $600 — and still leave you with only a bare board for your trouble. The Sinclair ZX80 changes all that. For just $295 you get **everything** you need including leads for direct connection to your own cassette recorder and television. The ZX80 really is a complete, powerful full-facility computer matching or surpassing other personal computers costing much more. The ZX80 is programmed in BASIC and you could use it for anything from chess to running a power station.

Two unique and valuable components of the Sinclair ZX80: the Sinclair BASIC interpreter and the Sinclair teach-yourself BASIC manual. **The unique Sinclair BASIC interpreter:** offers remarkable programming advantages — unique 'one touch' key word entry. The ZX80 eliminates a great deal of tiresome typing, Key words (RUN, PRINT, LIST etc) have their own single key entry. Unique syntax check. Only lines with correct syntax are accepted into programs. A cursor identifies errors immediately, preventing entry of long and complicated programs with faults only to discover them when you run.

Excellent string handling capability — takes up to 26 string variables of any length. All strings can undergo all rational tests (e.g. comparison). The ZX80 also has string input to request a line of text; strings do **not** need to be dimensioned. Up to 26 single dimension arrays. FOR/NEXT loops nested up to 26. **Variable names** of any length. BASIC language also handles full Boolean arithmatic, conditional expressions, etc.

Exceptionally powerful edit facilities, allows modification of existing program lines. **Randomise function,** useful for games and secret codes. **Timer under program control.** PEEK and POKE enable entry of machine code instructions, USR causes jump to a user's machine language sub-routine. **High resolution graphics** with 22 standard graphic symbols. **The Sinclair teach-yourself-BASIC manual** 96 page book **free** with every kit.

Fewer chips, compact design, volume production means MORE POWER FOR YOUR DOLLAR! The ZX80 owes its low price to its remarkable design; the whole system is packed onto fewer, newer more powerful and advanced LSI chips. A single SUPER ROM, for instance, contains the BASIC interpreter, the character set, operating system and monitor. And the ZX80's 1K byte RAM is roughly equivalent to 4K bytes in a conventional computer because the ZX80's brilliant design packs the RAM so much more tightly. (Key words occupy just a single byte). You can add to the memory via the expansion port, giving a maximum potential of 16K.


780-1 microprocessor - new, faster version of the famous Z-80 microprocessor chip, widely recognised as the best ever made.
VHF TV modulator.
Sockets for TV, cassette recorder, power supply.
SUPER ROM.
Clock.
RAM chips.
Rugged, flush, Sinclair keyboard.

ORDER FORM: SINCLAIR EQUIPMENT (AUSTRALASIA) PTY. LTD.
308 High St., Kew 3101, Vic. Tel. 861 6224.

Quantity	Item	Item Price	Total
	Ready-assembled Sinclair ZX80 Personal Computer(s). Price incl. ZX80 BASIC manual, excl. mains adaptor.	$295.00	
	Mains Adaptor(s) (600Ma at 9V DC nominal unregulated).	$16.00	
	Memory Expansion Board(s) takes up to 3K bytes.	$28.50	
	RAM Memory chips — standard 5K bytes capacity.	$10.00	
	Sinclair ZX80 Manual(s) free with every ZX80 computer.	$15.00	

I enclose cheque/Bankcard/Diners Club/Amex TOTAL

☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name ____________________

Address ____________________ Postcode __________

they're here!

LINSAC
sinclair ZX80
SOFTWARE
(and more to come)

C-12 CASSETTES, $12

per pack
Including postage & packing

PROGRAMS ON CASSETTE WITH FULL DOCUMENTATION.
ALL PROGRAMS RUN ON BASIC ZX80 SYSTEM UNLESS OTHERWISE STATED.

ZX80 COMPANION 87 PAGE BOOK $16

Book is arranged so that the intending user of the ZX80 entering computing may start using the system and gradually gain a better appreciation of the machine and facilities. The informed computer user will find the later sections useful in applying his knowledge to the ZX80 which has brought a breath of fresh air to the personal computer scene.

Linsac Software comes on C12 Cassettes with **Full Documentation** including
• Program Listing • User Instructions • List of Variables with Meanings
• Program Description • Sample Program Run

GAMES PACK ONE CONTAINS

G001 Three Towers
Rearrange the rings to build a new tower.

G002 Number Guessing
Find the hidden number with hints from the ZX80.

G003 Mastermind
Break the four digit code.

G004 Sketcher
Draw patterns of your choice with memory mapping.

G005 Hurkle
Hunt the horrible hurkle in the 15×15 grid.

G006 Nim
The familiar game of skill.

G007 Symbol Simon
Try and match the complex increasing pattern.

GAMES PACK TWO CONTAINS

G008 Nine Lives
A word game for two players — possibly fatal.

G009 The Maze Game
Find the treasure as the maze grows around you.

G010 Plain Sailing
Steer a yacht against dangerous currents.

G012 Noughts & Crosses
The ZX80 plays an excellent strategic game.

G013 Chinese Puzzle
Can you rearrange the blocks in the right way?

G014 Tower of Hanoi
The game of antiquity.

G015 Battleship
Realistic naval artillery action.

GAMES PACK THREE CONTAINS

G011 Fruit Machine (2-4K)
The ZX80 as a one-armed bandit.

G016 Four in a Line (4K)
A 2 player game arranging patterns of counters.

G017 Zombies
You are surrounded by zombies on a desert island.

EDUCATION PACK ONE CONTAINS

E001 Maths Drill
Two levels of aifficulty included.

E002 Dot recognition
Recognise the number of a random dot pattern.

E011 Musical Notes
Teaches children notes on the scale.

E004 Spelling Quiz
The teacher sets five words to be tested.

E007 Day Finder
Gives the day of the week for a date.

EDUCATION PACK TWO CONTAINS

E005 Graph Plotter
Plots quadratic equations.

E006 Prime Factors
Calculates prime factors of given numbers.

E008 Number Bases
Conversions and calculations in different bases.

E009 Bar Charts
Plots bar charts from supplied data.

E010 Statistics
A collection of statistical routines.

UTILITY PACK ONE CONTAINS

U001 Memory Display
Displays 80-byte blocks of memory (char/hex).

U002 Hex Code Monitor
Handles machine code routines.

U003 Renumber
A full renumber routine.

U004 Memory Search
Finds and displays byte patterns.

C-12 CASSETTE ORDER FORM

SINCLAIR EQUIPMENT (AUSTRALASIA) PTY. LTD.
308 High St., Kew 3101, Vic. Tel. 861 6224

Item	Quantity	Total
Games Pack One		
Games Pack Two		
Games Pack Three		
Education Pack One		
Education Pack Two		
Utility Pack One		
ZX80 Book		
	Total	

I enclose cheque/Bankcard/Diners Club/Amex
☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name ....

Address ....Postcode............

ETI2

PRINTERS

by Mike Dennis

There are over a hundred printer manufacturers in the world today and the wide range of facilities they offer frequently causes of a great deal of confusion. This month's exhaustive review sets out to explain how the various types of printer work and what options they offer; an easy-to-understand reference chart has been included to help you choose the printer most suited to your requirements. Every manufacturer and distributor whose name we could muster was asked to send as much literature (including operator and service manuals) as possible. Happily the response has been enormous.

For many of us, our first introduction to printers (or 'hard-copy' devices) was with the old teletype (TTY) . . . it was both excruciatingly slow and very noisy. Still, in its time the TTY was synonymous with hard-copy and it wasn't until the advent of the dot-matrix mechanism that any real change took place in the status quo. From that day on there has been a seemingly endless stream of improvements but, although the cost has dropped quite dramatically in a number of areas, the printer still comprises a major part of a system's total cost.

However, to the business user they are essential and, as program listings disappear off the top of the screen at an ever increasing rate, other computer users soon place a printer high on their list of priorities. The problem is — which one?

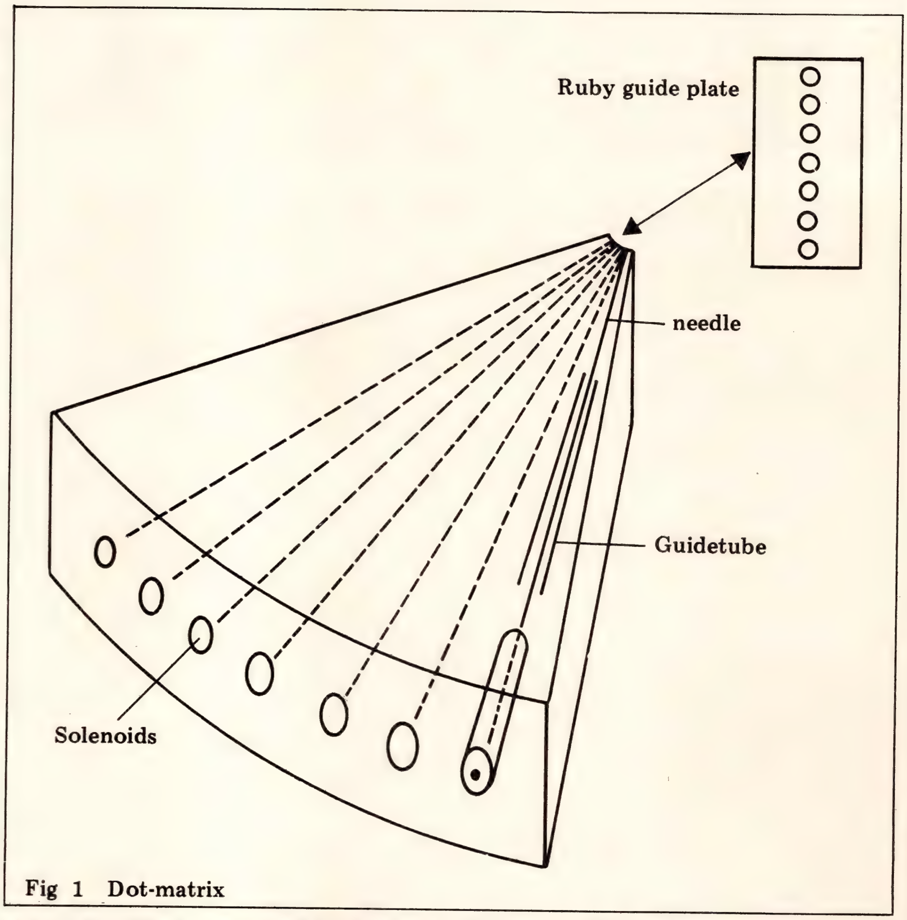


Fig 1 Dot-matrix

Basic concepts

Printers consist of three main components — the printing mechanism, a way to move the paper about and the controlling electronics. In addition there are other minor components such as a power supply, case and, where applicable, a ribbon. However, the heart of any printer is the printing mechanism itself and this is worth a comprehensive examination in its own right.

The first thing you notice is that some mechanisms are common to many printers. Some individual printer manufacturers buy-in the mechanism from an OEM supplier and then add the rest of the components to their own particular specification. This is one of the main reasons behind the proliferation of printers and, although the various suppliers were asked to disclose any areas of common interest, many were rather coy about it. Unfortunately that made true cost comparisons and value-for-money assessments all the more difficult.

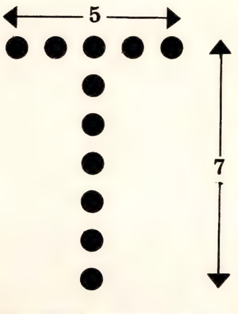


Fig 2

The mechanisms themselves can be defined by three basic characteristics.

1 How the character is placed on the paper. *Impact* types such as the TTY use a hammer or similar object to strike the paper with the appropriate character. *Non-impact* types such as thermal printers as the name suggests do not strike the paper but use alternative methods.

2 How the character is formed. Fully-formed characters such as those in normal typewriters will print the whole character simultaneously. The alternative is to assemble the character by printing dots into a pre-defined pattern — the dot-matrix. This implies several printing actions to print one character whereas fully-formed characters require only one.

3 The number of characters printed or assembled at a time. If it's only one character, then the printer is a *character* printer. The alternative method is to print a whole line of characters in one go — the *line* printer.

All the various types of printers are summarised in Table 1 according to their characteristics; these I shall now examine in greater detail.

Impact printers

The earliest form of impact printer was the ubiquitous teletype or teleprinter and models such as the Creed 7B can still be picked up for around $50 on the second-hand market. The characters to

Table 1

IMPACT
Dot-matrix
Golf-ball
Daisy-wheel
Drum
Chain
Comb
TTY
Spinwheel

NON-IMPACT
Thermal
Electrosensitive
Ink-jet
Laser
Electrographic

FULLY-FORMED CHARACTERS
Golfball
Daisy-wheel
Drum
Chain
Spin-wheel
TTY

MATRIX
Dot-matrix
Comb
Thermal
Electro-sensitive

CHARACTER
Golfball
Daisywheel
Spinwheel
TTY
Dot-matrix
Thermal
Electrosensitive

LINE
Drum
Chain
Comb

be printed are arranged as small printing elements or 'type-slugs' and they lie in grooves around an annular ring. As the code for each character arrives at the TTY, this ring is rotated until the correct element is in the firing position. A hammer then strikes the element which in turn presses a ribbon against the paper and the character is typed.

Each element has to be capable of printing two characters since there's insufficient room to fit all the elements around the ring. Shifting between the two character sets is accomplished by moving the whole carriage assembly on which the paper is mounted. Upon receipt of the 'figures' code, the carriage latches mechanically and thereafter all printing codes access the figures character set. The mechanical latch is reset to its other position only when the 'letters' code arrives, and from then on the 'letters' character set is printed.

Not a lot happened in the printer world until the arrival of Centronics and the dot-matrix mechanism. Early examples of this type of mechanism shared one common feature, namely a vertical row of pins or needles that were attached to solenoids or electromagnets. When energised, they 'fired' the needle at the ribbon and thus made a mark on the paper — see Fig 1. The actual number of needles fired at any one time would depend on the character to be printed; the print-head mechanism or needle assembly would then move one column along, fire the next selection of needles and so continue to build up the desired character until complete. For example, the letter B would require all seven needles to fire for column 1 whereas the letter T would only need the top needle. Thus any character could be made up or assembled by firing the pins in a pre-defined dot-matrix. As can be seen from Figure 2, the early matrix dimensions had five columns and fired up to seven needles.

Since the needles needed to hit the paper both quickly and hard in order to maintain print quality and speed, the solenoids had to be large and powerful. This, in turn, meant that the needles had to be bent to make room for them which, in turn, meant more friction and heavier hammers. As the needles slid up and down their guides a couple of rather unpleasant things happened. One, the tube bores wore out and two, the friction generated heat, reducing maximum operating speed and useful life. Another disadvantage with the somewhat limited matrix of 5 x 7 was the comparative coarseness of the printed characters — diagonals in particular suffered badly.

The first problem has been cured in a number of ingenious ways. The early arrangement was for mounting the solenoids in the horizontal plane but since this has meant angling some of the needles quite severely many manufacturers now mount them radially. Thus the needles don't have to be bent as much which in turn means lower friction and wear, and less heat generation — resulting in an improved printing rate and head life. Another bonus is that the needles can be made harder which again enhances the print quality and head life. As you can see many compromises have to be made when designing dot-matrix heads and it's hardly surprising that firms like DRE use computer assistance to optimise head design.

Another improvement is to separate the needle from the driving solenoid; this is the basis of the 'ballistic' or 'free-flight' head. The principle is to hold the needle back against a spring and to release the stored energy at 'fire' time. After the needle has printed the dot, it rebounds and this rebound energy is used in conjunction with a smaller solenoid to compress the spring again, ready for the next release — see Figure 3.

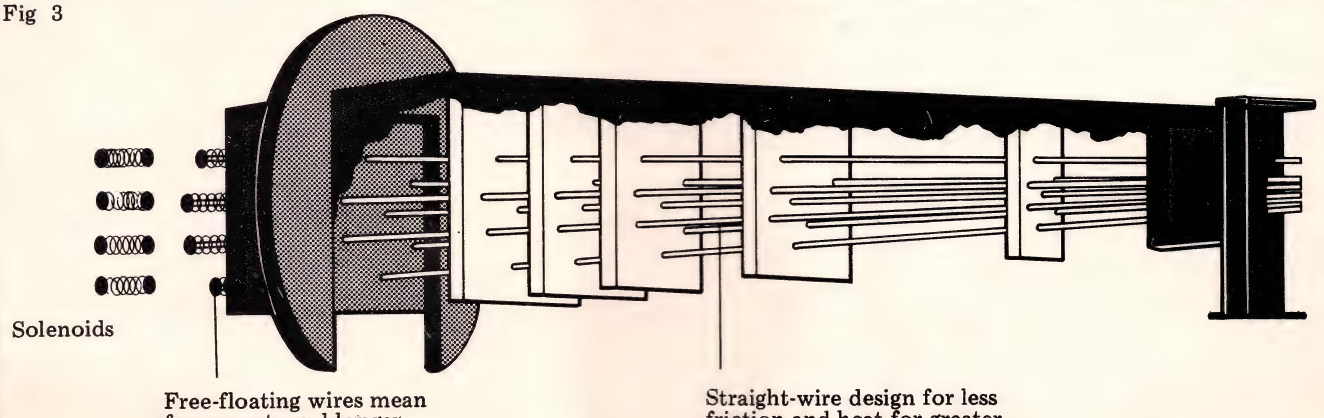
This idea of storing energy appears in Facit's Stored Force Flex Hammers. Here the solenoids are arranged in a semi-circle and the needles are replaced by very hard 'pips' mounted directly onto the armatures; these pivot when the power is applied. This drives the 'pips' towards the paper and, providing the hammer travel is kept low (so Facit claims), head life is lengthened considerably — see Figure 4.

The problem of legibility has been partly overcome by the use of finer matrices — such as 7 x 7 or 9 x 7. Table 2 lists the currently available formats and Fig 5 shows a 9 x 7 half space float. In fact, some of the dot-matrix formats are so fine that Japanese (or Katakana) characters can be printed — which is really going some. Of course, since each needle can be fired individually, it didn't take the printer manufacturers long to realise that virtually any character could be printed provided the original matrix dimensions were fine enough (hence 7 x 9) and the necessary control was available (at this point, enter the microprocessor). This explains the Nx9 or Nx12 that some manufacturers supply, the N meaning that the number of columns needed to make up a character is a variable and under program control. If a large number of columns is used then the fidelity of the printed character is improved and approaches that obtainable from a typewriter. An increase in characters can be printed, although many printers have no lower-case descenders. This gives rise to that horrible looking format where the tails of p, q, y etc. sit up on the line . . . thus pqy. Some of the 7x7 formats boast true descenders but very often the descender is in fact quite minimal. You really have to buy a printer with a 9 needle head if you're after superb descenders; then you're also likely to get underline capability as well.

Table 2

Common formats		other formats	
H	V	H	V
5	7	6	7
7	7	8	7
9	7	8	8
9	9	10	9
N	9	11	9
N	12	15	14

Fig 3



Free-floating wires mean fewer parts and longer trouble-free operation.

Straight-wire design for less friction and heat for greater durability.

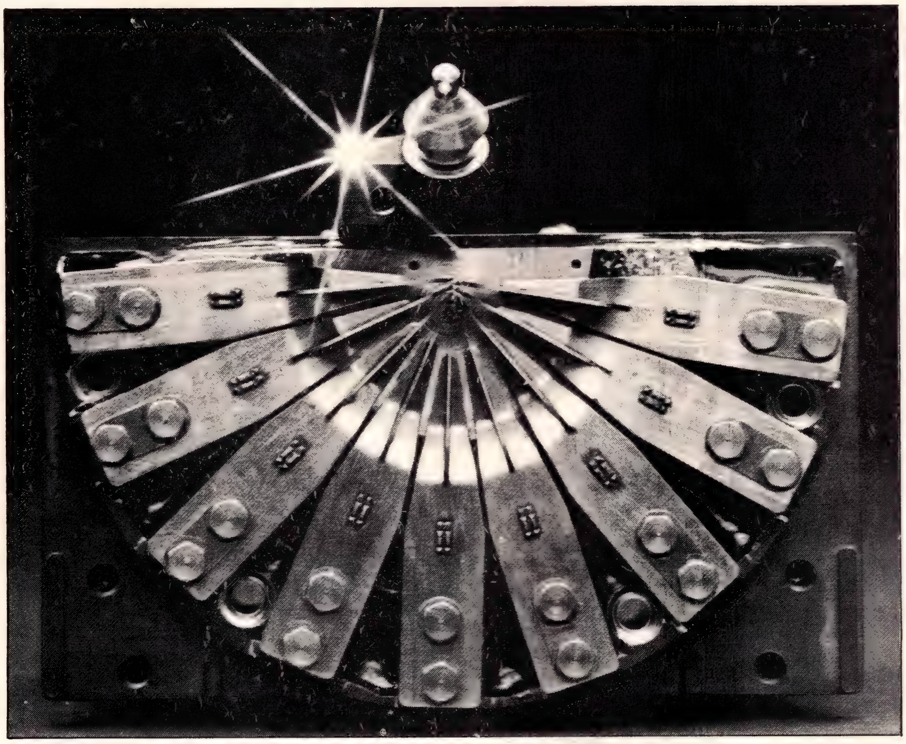


Fig. 4

There are many other advantages to be gained from microprocessor control and some of these will be discussed later. However, one significant trend emerging and, currently being marketed or developed by a number of manufacturers (such as Binder — Racal Recorders — and Centronics) is the dual-purpose printer. These work on a fine dot-matrix format that's capable of typewriter quality printing. This is of particular importance in word-processing applications. There's a penalty of course . . . in this case a slowing down of the printing rate because more dots have to be printed per character. When speed is of prime importance (such as when printing listings) then the matrix format can be 'coarsened-up' for much faster output.

The nett result is to have two printers in one and the ability to switch between the two types of performance with a software switch. The Binder 41 32KP can either print a standard dot-matrix at 240 cps (characters per sec) or a 'correspondence' font at 85 cps. Currently the average price of this type of printer is still high but I wouldn't mind betting it'll drop quite a lot before too long.

I've dwelt on dot-matrix printers at some length — because it's in this area that some of the most exciting developments are being made. However there are other types of impact printer.

Daisy-wheel print elements are very similar to typewriter slugs in that they're fully-formed although in this case, mounted on the ends of radiating metal spokes — see Fig 6. You can see, perhaps, a slight similarity with the TTY. Upon receipt of the appropriate character code, a ROM inside the printer will effect rotation of the wheel so as to correctly line up the wanted character with the hammer, and also decide on the appropriate hammer velocity. The wheel is then struck. Currently, the number of characters or 'petals' on a wheel is limited to a maximum of 96 although Qume does offer the facility of simultaneously mounting two daisy-wheels at a time, making a total of 192 available characters. The alternative to this is to use the 'spinwheel' as used by the NEC Spinwriter. Here 64 petals are bent up, effectively increasing the radius and enabling 128 characters to be fitted (there being two characters per petal).

Apart from the obvious advantage of superior print quality, one daisy-wheel can also be easily exchanged for another of different typeface; there are over 100 such typefaces currently available. There are differences too in the materials used to make the wheels, Qume tending to opt for plastic, with Diablo preferring metal (although I see that it does now offer both). There are arguments both for and against and, although metal wheels last longer, with plastic wheels coming out at around a third of the cost, that's one argument that doesn't hold much water. The only slight advantage that metal wheels have is in producing a marginally crisper print. Plastic wheels, however, are so cheap you can stock up with three times as many different type-fonts for the same cost. Yet another advantage of plastic wheels is that, being lighter and therefore possessing less inertia, they can be spun round faster than metal ones. The printing speed — always one drawback of the daisy-wheel — is typically a maximum of 55cps with plastic wheels and only 45cps for metal. For many uses this speed is too low and you can see why there is the feverish development in matrix printers that I discussed earlier.

Another feature of daisy-wheel printers, often overlooked, is that if you purchase the version with a keyboard (which usually costs about another $400) since you can operate it in a 'local' mode, you've effectively made yourself an electric typewriter for only '$400'. Where else can you buy one of that quality and at that price? And a final plus . . . the daisy-wheel is the only printer I know of that's capable of printing sub and superscripts.

The last of the impact devices to be considered (at least as far as 'character' printers are concerned) is the faithful IBM Selectric and variations thereof. These are now appearing on the refurbished (second-hand) market with suitably modified insides and an interface to suit your computer. The printing mechanism in this case is a golf-ball; a fully-formed character printer, the individual symbols are raised up from the surface of a metal ball. This ball is attached to a mechanism of almost frightening (well, it is to me!) complexity which twists and raises the correct portion of the ball into the firing line. In common with other hairy mechanical devices, the golf-ball print speed is quite slow -- about 15 cps. The print quality, however, is superb . . . some would say the best as it's effectively an electric typewriter. Again, it offers the advantage of having exchangeable typefaces, although you have to be 100% certain that the electronic interface fitted can handle your choice; with the differing golfball layouts available, you might well end up printing gibberish.

Non-impact printers

The two main types of non-impact printer are electro-sensitive and thermal. Both operate on a similar basis to matrix printers but instead of needles they use (respectively) an electric field or a heat field. Both require special paper and the electrosensitive type is that nasty looking silvery stuff. The thermal paper is creamy-white in colour and produces quite a readable print . . . far less objectionable in my opinion. A typical price for thermal paper is $4.00 for an 80' roll — which makes it fairly expensive — while the other type is cheaper. The advantages of both thermal and electro-sensitive are a relatively high speed (about 40 cps for the Trendcom 100 thermal printer) and an almost sublime silence when in operation — it sounds so effortless. One possible disadvantage, apart from the special paper, is that the paper width is sometimes limited (less than 5") but there's an increasing number of manufacturers (Trendcom included) now offering an 8½" width.

Another, perhaps more serious, disadvantage inherent in both designs is that only one copy can be made at a time as opposed to up to 6 that some of the impact printers can manage.

Typewriter modifications

Last but by no means least in the mechanisms is a strange beast that defies any classification in the printer camp per se. I refer to the Keypak which is a handy device and clips over an existing electric typewriter keyboard. Small solenoids in the Keypak then depress and actuate the existing typewriter keys. Restrictions are that the typewriter must have a powered carriage-return and a certain amount of adjustment of external timing delays is needed to suit the particular typewriter used. What you get is, effectively, correspondence quality print at whatever maximum speed the

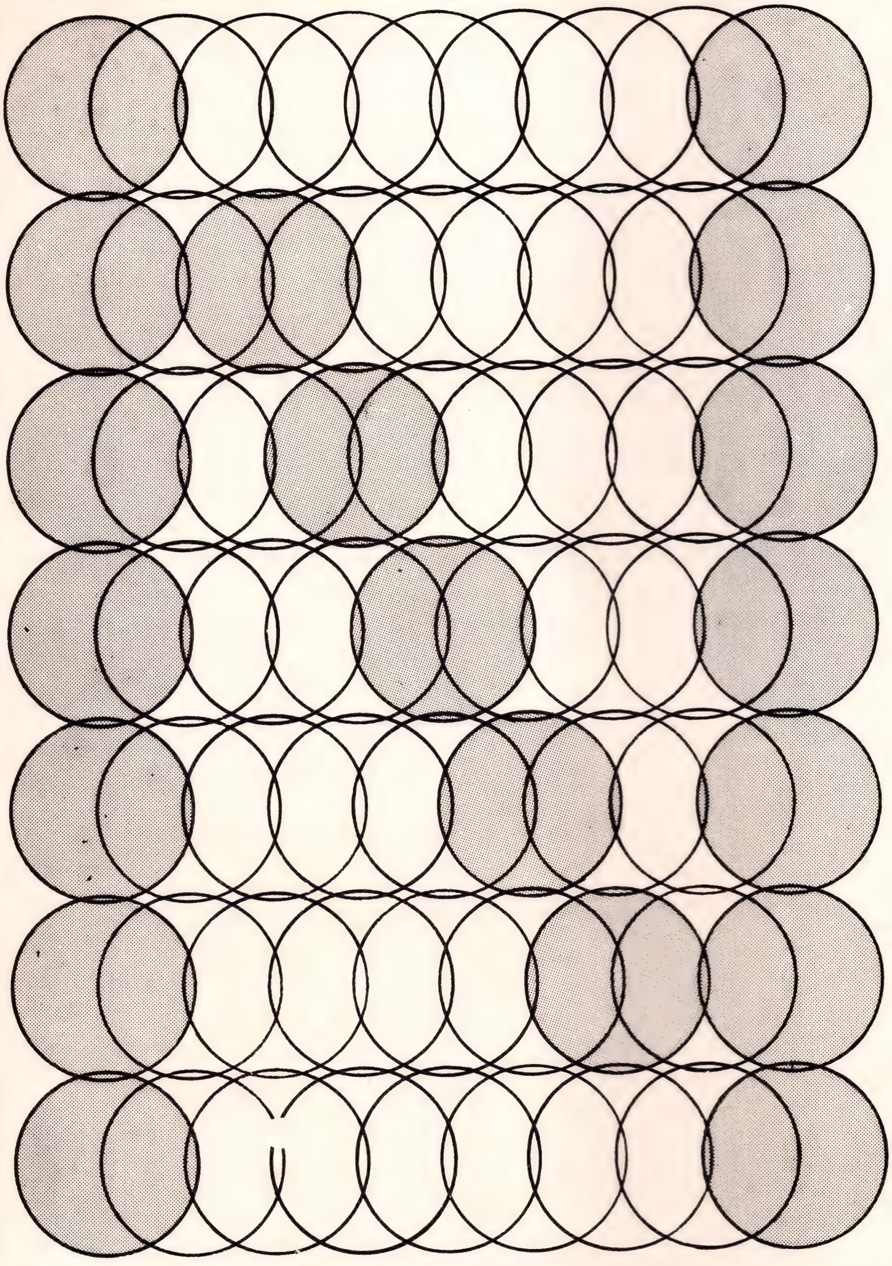


Fig. 5 9 x 7 Half space matrix font

typewriter will run. I also hear rumours of another add-on that lives underneath the keys but was unable to find out any more information on it.

Line printers

If throughput is a problem then the line-printer is just the job for you, although you will find most of them rather expensive.Three methods of printing are used — namely the drum, the chain and the comb all of which print a complete line in one go. Both drum and chain methods use fully formed letters and also strike the *paper* against the ribbon and then on to the character on the chain or drum. This is known as 'back-striking'. as opposed to the 'front-striking' mechanism of the ordinary typewriter where it's the character that does the striking. In the drum printer, the characters are arranged in rows down the axis of the drum — a complete row of 132 A's (assuming it's a 132 column printer), then a row of B's etc. Behind the paper is a row of 132 hammers, each being activated when the appropriate character passes it. For one line of print to be made the drum must revolve once. The paper then moves up to the next line and the process is repeated.

The chain, or train, mechanism comprises a series of metal slugs joined together and driven along a guide channel in front of the paper and ribbon. Each slug comprises one character and, when it reaches the appropriate column, the paper is struck from behind by the corresponding hammer — very similar in fact to the line printer.

A closely related mechanism is used by the band printer but this time the characters are impressed on a metal band that is then used in a similar fashion to the chain or train. One advantage of the band printer is that bands can often be changed quite easily, to effect repair or font change. If the character set is duplicated in either chain, train or band then a speed improvement will result. The actual number of hammers also varies and the maximum throughput occurs when there is one hammer per column on the paper. This makes the printer correspondingly more expensive and so, to compromise, some printers share one hammer between two or four columns and the mechanism or the paper is moved sideways during printing.

The third type of line printer uses the 'comb' mechanism. Pioneered by Tally it's a compromise between the number of active elements (hammers) and the printing speed. The comb has 132 teeth and on the end of each tooth is a hardened 'pip' — see figure 7. Behind the tooth is, wait for it, yes — an electro-magnet! The design is quite ingenious because, to print a dot, the required comb is pulled back with the magnet and then released . . . whereupon the tooth flies back and strikes the ribbon on to the paper. This is only the first dot in the character that we are building up and the comb is then moved sideways to the next dot position within character and the required teeth fired. Don't forget that since we have 132 hammers we could be building up 132 characters simultaneously. When all the dots have been fired for the first row, the paper has to be advanced by one dot row position ready for the next row of dots to be printed. However, to save time the comb row moves over in the opposite direction. The comb therefore reciprocates along the print line, making 3½ complete cycles per character row — see Figure 8. The end result is a printer with no fast-moving parts or requirement for critical timing.

A different principle is used by OKI in its line printers. Here either 22 or 33 small solenoids are used with the needles attached directly to the armatures. Because they are mounted at right angles to the paper there's no question of bending the needles and so normal dot-matrix type problems are eliminated. Each hammer or solenoid is shared between 6 or 4 characters respectively and each character is then assembled in a similar fashion to the 'comb'.

Cautionary note

The important point with any quoted line speeds/minute is that it depends on the number of characters per line, and this applies to all types of printer. Also remember that although a uni-directional printer may be quoted as having a printing speed of 120cps — time will be wasted while it does a carriage return. The effective throughput will be less than a printer running at the same quoted characters/sec, but with bidirectional printing capacity.

Paper control

There are three main types of paper movement or control, the most common being the 'pin-feed' which uses computer listing paper with sprocket holes down each side. At the end of the platen (the roller that the paper goes round) are spikes or 'pins' that locate with the holes in the paper and drive it along at line-feed time. The drawback with early versions was that the distance between the sprockets was fixed and so you were stuck with using only one size of paper. The alternative was to purchase different platens to suit different paper types and some manufacturers have gone along that line by simplifying the changeover procedure.

Another method is to do away with the platen altogether and have a

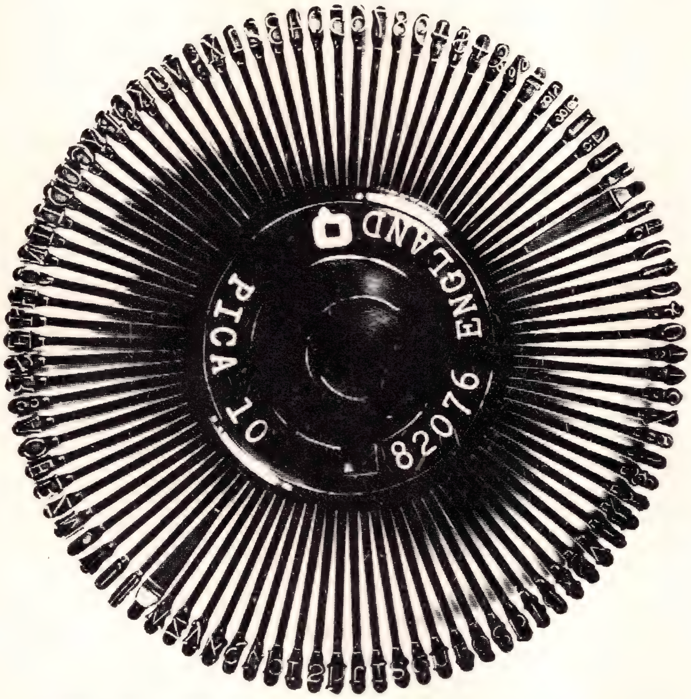


Fig 6

narrow strike plate behind the paper fire-line and then to pull the paper over this plate. In this case the sprockets are mounted on a separate rod along which they can be slid to accommodate different widths of paper. The disadvantage with some of these pin-feeds is that the paper is not under very tight control as there is no tension holding it back below the print line. This turned out to be a problem, especially with forms such as invoices etc, and so the adjustable tractor was developed. This device (standard fitting for some, while an optional extra for others) can be adjusted for paper width and also provides a firm 'traction' path through which the paper is driven. Another feature is that for about 3 inches above the print line, the paper is held flat which makes reading while printing much easier. This 3 inch path also means that there are more teeth in contact with the paper than with the pin-feed and so there is less chance of the paper jamming or tearing.

Where the control of paper movement is really critical — when graph plotting for example — then the technique is to use a double-tractor mechanism both before and after the strike plate. The paper is therefore really gripped tightly and pulled hard back against the strike plate. The double-tractor also means that the paper can be moved backwards which again is a great asset when graph plotting. Don't automatically think that the forms-tractor is always better then the pin-feed because some of these tractors that are optional extras can move about a bit, albeit by only a tiny amount . . . a small point that you should be aware of.

The next method is the friction feed and this is used where sprocket holes are taboo — for instance when writing to your girlfriend! The operation is identical to a typewriter and usually works fine. The only problem arises when continuous stationery is used as, after a time, no matter how carefully you insert the paper it will gradually creep along the roller; you end up typing off the sheet.

Friction feeds are definitely for those who detest invoices with holes down the side. The alternative name to this feed is the 'single-sheet' feed and, as the name suggests, you put in the sheets one at a time. Well, computers are supposed to save you time, remember, and it can be irritating to stand around feeding the thing. Therefore a handy gadget to have at this time is the single-sheet feeder which takes approximately 200 single invoices or letter heads and will feed them one at a time into the guts of the printer, print them and then stack them up neatly for you in a little tray!! The drawback is that the gadget costs about $1500 and tends to be used only with daisy-wheel printers.

Paper can be fed or loaded into the printer from a number of directions. One of the easiest is from the top where it goes in like a typewriter, and one of the worst is where it goes in the back — as in the Microtek. Other options offered are bottom feed and front feed, although bottom feed may be a factory fitted option.

Many printers fit 'paper-out' indicators that either light a lamp or buzz where appropriate. Among the paper terms that you may come across is 'fan-fold' where the paper is folded alternately, as in a fan; this makes storage of the printout much more manageable. Most printout paper is fan-folded. Some paper comes as two-part and with or without a carbon; copies can be easily made. If you're going to make copies, then make sure that your printer is capable of producing the required number at a time. Printers such as some Facit models feature a 'floating' print head that automatically compensates for different thicknesses of paper whereas some others need the hammer intensity and head adjustment to be performed manually.

There are extra features that are worth looking out for (which are not always automatically provided but that you might find important) . . . for instance printers with facility for winding the paper forward or backwards manually; it's also nice to be able to tear off the paper at a convenient point. Many printers have the tear-off point some way on from the print line which means that you can't start new sheets from the top of the page.

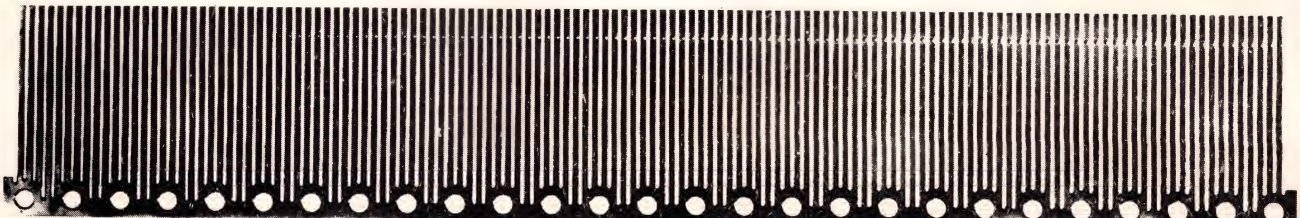
In general terms paper handling is fairly straight-forward and there aren't usually any great problems. Remember, though, that friction feeds do mean that you can print on virtually any form of paper . . . even stencils and offset litho masters and that is often quite important.

This next section is one closely associated with paper — the choice of ribbon. Features to look out for here are the life of the ribbon, how easy it is to replace and how much it will cost. The current buzzword appears to be the 'Mobius' loop where both the top and bottom halves of the ribbon will eventually be used. Some use 'intelligent' ribbons — such as Qume's Multistrike which is supposed to wind the ribbon on only as far as the width of the last printed character, thereby lengthening the ribbon's life. For really excellent print quality you need a 'singlestrike' (or carbon) ribbon which, although producing exemplary print, only lasts for one pass and then has to be thrown away. Some printers feature two-colour printing (usually red and black) and there's even a superb colour printer by Trilog that uses a three colour ribbon in the company's own colour plotter/printer.

Taking Control

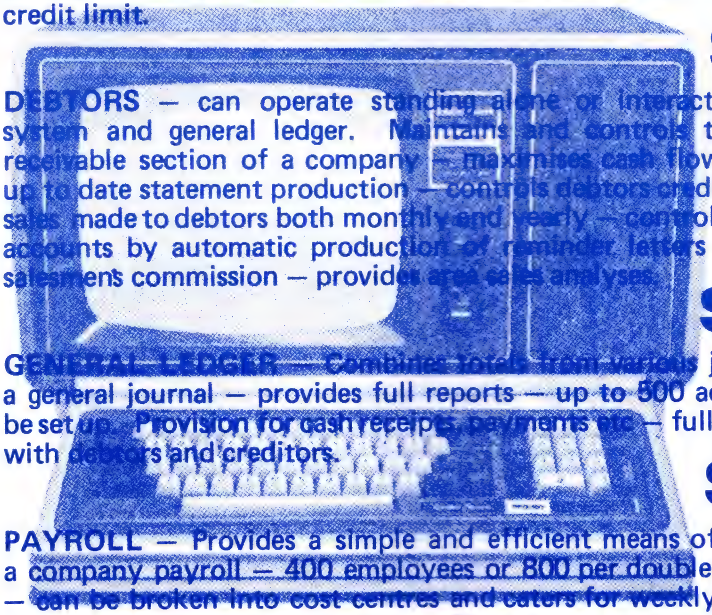
Some of the modern trends in microprocessor control have already been mentioned but, before I expound on the

Fig 7



MODEL 2

Deforest Software proudly announce a fine range of fully interactive software written in Australia for Australian conditions.



INVOICING WITH STOCK CONTROL — Will maintain and control stock levels, produce a detailed invoice or credit note on line — will analyse sales and profitibility of all stock lines — analyses sales and profitibility of stock groups. Fully interactive with debtors system — during invoicing shows current stock levels and details and customer credit limit.

$700

DEBTORS — can operate standing alone or interact with stock system and general ledger. Maintains and controls the accounts receivable section of a company — maximises cash flow by prompt up to date statement production — controls debtors credit — analyses sales made to debtors both monthly and yearly — controls delinquent accounts by automatic production of reminder letters — calculates salesmens commission — provides area sales analyses.

$500

GENERAL LEDGER — Combines totals from various journals into a general journal — provides full reports — up to 500 accounts may be set up. Provision for cash receipes, payments etc — fully interactive with debtors and creditors.

$500

PAYROLL — Provides a simple and efficient means of automating a company payroll — 400 employees or 800 per double density disk — can be broken into cost centres and caters for weekly, fortnightly and monthly pay periods — provision for cash includes coinage, cheque and bank transfer — a total of 20 allowances or deductions are provided for either before or after tax — 10 rates of pay.

$700

These programs can be sold separately or as part of a complete computer system, from as little as **$8200** (depending on options).
The lease amount on this figure is only **$45.40**
(PER WEEK)

Fully Interactive Business Programmes

Number I in software for the Model II

MODEL II EXTENDED BASIC

A family of enhancements to the Model II BASIC interpreter. Part of the package originated with the best of APPARAT, INC's thoughts in implementing NEWDOS BASIC. The system is written entirely in machine language for SUPER FAST execution. The extensions are fully integrated into Model II BASIC AND REQUIRE NO user memory, and NO user disk space. The package is made up of the following five modules, each of which may be purchased separately.

XBASIC — Six single keystroke commands to list the first, last, previous, next or current program line, or to edit the current line. Ten single character abbreviations for frequently used commands: AUTO, CLS, DELETE, EDIT, KILL, LIST, MERGE, NEW, LLIST and SYSTEM. $25

XREF — A powerful cross reference facility with output to display and/or printer. Trace a variable through the code. Determine easily if a variable is in use. $40

XDUMP — Permits the programmer to display and/or print the value of any or all program variables. Each element of any array is listed separately. $40

XRENUM — An enhanced program line numbering facility which allows specification of an upper limit of the block of lines to be renumbered, supports relocation of renumbered blocks of code, and supports duplication of blocks of code. $40

XFIND — Permits quick and easy location of specified strings or keywords within the program text. $30

SAVE - on the purchase of the entire package $140

SKRUNCH

A SUPER FAST TRSDOS UTILITY. Compresses your BASIC programs to an absolute minimum. Typically saves 30-40% space, even for programs without REM statements! Also results in 7-10% improvement in execution speed. $35

FRIEND
FOUR NEW TRSDOS COMMANDS!

SHOW — A much better multi-disk directory display. Let's you see only those files you want, and includes date of last update.
MOVE — A much better file copying command. Copy/Move whole groups of files, renaming them at the same time if desired, with just one command!
ERASE — Better than KILL. Better than PURGE.
PRINT — Print BASIC programs from disk, whether saved in ASCII or compressed.
All 4 DOS commands allow fast processing of one, or complete groups of files, based on generic naming and wild card specifications. Enhanced functions too numerous to fully describe here.

EXAMPLES:
SHOW PAY*/BAS:*
Directory display of all '/BAS' files on all diskettes which begin with 'PAY'.
MOVE PAY*/BAS 1 TO /OLD:3
Save current versions of payroll programs to drive 3, changing extension to '/OLD'.
MOVE OLD*/* TO NEW /:1
Copy all files on drive 0 which begins with 'OLD', regardless to extension to drive 1 changing the first three letters of the file name to 'NEW', but retaining the same file extension. Save time!
Reduce frustration!
Eliminate ERROR 33! $75

SPOOLER - Model I and Model II

Our workhorse! This package, available for Model I, in the TRSDOS/NEWDOS or NEWDOS 80 versions, or for the Model II, greatly enhances system performance when running typical business applications. Many applications have been benchmarked to run nearly TWICE AS FAST with the SPOOLER installed. Installs in minutes, and no changes are required to your programs. Preferred Model II versions require NO user memory. Optional features for the Model II version only. Serial printer support, and DISK SPOOLING support is particularly recommended for word processing applications. $100

SERIAL PRINTER OPTION $50
DISK SPOOLING OPTION $50

ITOII

A helping hand when converting BASIC programs from the Model I to the Model II Automatically adjust PRINT @, and PRINT USING to compensate for differences in the language. Advises you where adjustments are necessary for PEEK, POKE etc. $25

HOSTII/TERMII

Allows 'remote control' of a Model II from another Model II, or any ASCII terminal. If terminal is a Model II, accurate screen positioning (PRINT @) is fully supported. Requires NO user memory! This system is designed to provide software support to our customer locations without ever leaving the office. $50

SAVE

Retrieve the resident BASIC program following an accidental re-boot, an accidental SYSTEM or a system crash. DON'T BE WITHOUT THIS ONE. YOU NEVER KNOW WHEN YOU WILL NEED IT! $35

DOSFIX

A collection of patches to TRSDOS and BASIC to enhance their usability and function. Includes our well known BREAK7E patches to keep the break key from being used accidentally. FREE WITH ANY MODEL IF SOFTWARE PURCHASE.

THE FINE PRINT

TRS-80 is a trademark of the Radio Shack division of Tandy Corporation.
NEWDOS and NEWDOS/80 are trademarks of Apparat, Inc.

T DAM

Automatically read and write your random access files. Never worry about fielding again $35

DIVERGE

Compare 2 BASIC program files showing differences. $35

REBUILD

Reorganise programs for adding code and rearranging $35

SIFTER

12 high speed sorts inc. demo programs $35

SHRINK

Make every byte count!
Reduce by 25-40% $35

SUPERSEDE

Write programs in shorthand, change variable names $35

MINGLE 2

Merge up to 14 files. $35

AIDS 3

Marvellous data base c/w machine code assisted sorts and print. sub system $125

CALCULATION SUB SYSTEM 3

Fields in any order.
Columnar totals and subtotals, computations using field values and constants $46

TRS-80* (Model II)

CPM version 2.1	$210
WORD STAR "The Ultimate Word Processor" (requires CPM)	$420
C Basic 2	$120

The following business programs are fully interactive and written for Australian conditions.

Creditors	$400
Debtors and Invoicing	$500
Order Entry/Invoicing/Stock Control	$700
General Ledger	$500
Payroll	$700
Direct Mail	$700

DSM

Disk Sort Merge for random files — superfast sort $160
Basic Cross Reference Utility — Seek and find instructions for variables, line numbers, strings, keywords $55

GSF

The standard against which other sorts are compared; machine language, multi-key, USR peeks and pokes. $160

AUSTRALIAN PRODUCTS

green screen

- Give your monitor the luminous green character found on the very expensive computer.
- Add professional look to your system & programmes.
- The screen may be easily removed; no modification to monitor.
- This product is not an inferior thin product, but 1/8" thick quality material. For business applications, reduced eye strain which improves operator efficiency. For the hobbyist, brighter and bolder graphics.

Screen for Model 1* $19.95
Model 2 $24.95

Specify if current model VDU.

DISKMASTER organises your disks. This program automatically reads disk directory and even renames disk if you wish and gives either a screen or printer output if your software. Even shows free granules and what systems on each disk. Only required one drive $24.95

AZIMUTH FINDER – Amateur radio gives beam heading, call signs and distance for 100's of countries screen or printer. $14.00

HIGH RESOLUTION FOR THE TRS-80*

NOT A KIT!

INSTALLS IN SECONDS!

DOES NOT AFFECT WARRANTY!

384 x 194 RESOLUTION

UPPER AND LOWER CASE WITH DESCENDERS

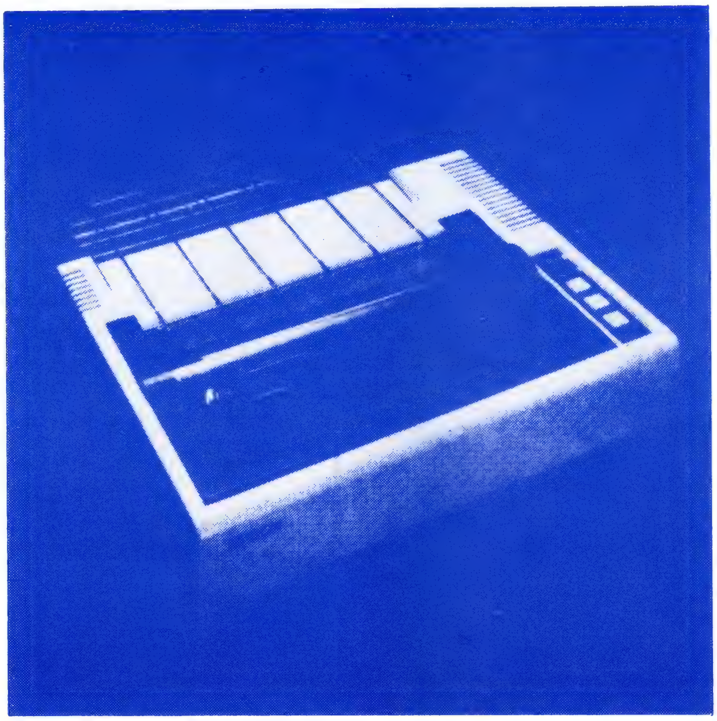
SUPER 80 is a unique Australian invented and manufactured hardware/software package which will integrate high speed, high resolution graphics into any level II TRS-80 system. The installation of **SUPER 80** will not affect normal operation of the TRS-80. A fully buffered expansion and edge connector is provided so that other peripherals may be used. Fully protected against over voltage.

*Comes complete with SOFTWARE
POWER SUPPLY
MANUAL
CABLE

ONLY **$439.00**

Also available at City Personal Computers, 75 Castlereigh St., Sydney

If you just bought another printer, boy are you gonna be sorry.



don't be fooled!

- *lowercase has descenders
- *Interface cable is not an extra
- *readable 9x9 matrix
- *90 day warranty

Epson.

The Epson MX-80. It's not just another worked-over rehash of last year's model. It's a top-of-the-line printer. It's new. From the ground up. And it's the most revolutionary printer to hit the market since Epson invented small printers for the 1964 Olympics in Tokyo. Don't take our word for it, though. Compare. There simply isn't a better value in a printer. Period.

But here's the fact that's going to stand the printer world on its ear. The MX-80 sports the world's first *disposable* print head. After it's printed about 60 million characters, you can throw it away. Because a new one costs less than $40, and the only tool you need to change it is attached to the end of your arm.

Now that's revolutionary, but that's only the beginning. The MX-80 also prints bi-directionally at 80 CPS with a logical seeking function to minimise print head travel time and maximise throughput. It prints 96 ASCII, 64 graphic and eight international characters in a tack-sharp 9 x 9 matrix. And it provides a user-defined choice of 40, 80, 66 or 132 columns and multiple type fonts.

The MX-80 is the first of a revolutionary series of Epson MX Printers. These employ the most advanced automatic assembly and machining techniques in existence to produce a printer that is incredibly versatile, remarkably reliable and extraordinarily inexpensive. It's a printer that could only come from the world's largest manufacturer of print mechanisms: Epson.

If it sounds like we're proud of the MX-80, we are. Not only does it do things some of the world's most expensive printers can't do, it'll do them for you for less than $950. That's right. Under $950*.

And if that isn't revolutionary, we don't know what is.

The world's first disposable print head. It has a life expectancy of over 50 million characters, yet it's so simple, you can change it with one hand. And it costs less than $40.

DEFOREST SOFTWARE

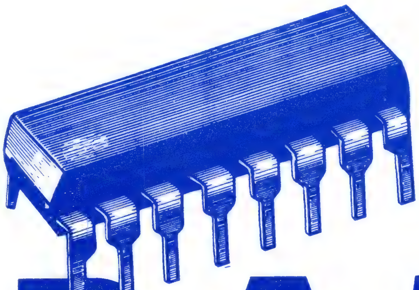
26 Station Street, Nunawading

**For TRS-80, includes Sales Tax — IEEE, RS232 or APPLE 2 interfaces are slightly higher.*

EXTRA

H • PRICE BREAKTHROUGH • PRICE BREAKTHR

SUIT TRS 80
SORCERER
APPLE



RAM

EXPAND YOUR MEMORY AT AN INCREDIBLY LOW PRICE

16K RAM – $57.00* •200ns
32K RAM – $110.00* •Available now

* Installation $20.00 extra for 16K

MICROLINE 80

$860.00 TAX PAID

9 x 7 Matrix – Includes Sales Tax – no descenders or ascenders – does **NOT** *include interface cable.*

WEST COAST COMPUTER FAIRE

De Forest Software have a limited number of vacancies for a tour to the USA departing Saturday March 29 by direct flight ex Sydney, arriving back, Tuesday April 6, 1981, Melbourne.

For further details, ring Peter de Forest on (03) 877 6946.

bankcard
welcome here

Just ring with your Bankcard Number and Expiry Date and we will immediately forward goods.

POSTAGE IS INCLUDED AT NO CHARGE, HOWEVER WE SUGGEST REGISTRATION OR CERTIFICATION.

26 STATION STREET, NUNAWADING, VIC. AUSTRALIA
Tel: (03) 877 6946, 878 9276

DEFOREST SOFTWARE

**TRS-80 is a Trademark of the Tandy Corporation.*

GAMES
TRS-80* (MODEL 1)

Sargon 2 — The ultimate Chess Game for any Microcomputer 16K Level 2	$37.50
Microchess — Level 1 or 2 TRS-80. Plays an entertaining game 3 levels fits in 4K	$24.00
Golf & Crossout — New improved version, good graphics. You can even design your own championship course.	$10
Santa Paravia — up to 12 can play, become the king of a medevil city, levee taxes	$10.00
Battleground — The stark reality of World War II comes alive in this program	$12.50
Game Playing with Basic — 3 tapes 1, 2 & 3 based on the book of the same name great for learning	$12.50 ea.
Oil Tycoon — 2 players, explore, drill for oil, outprice the opposition, force him into bankruptcy	$10.00
Space Trek IV — population simulation, trade or wage war send missions to space, can you survive?	$10.00
Checker King — not just an ordinary checker game but a fast expert machine language challenge.	$27.00
Flight — Control your own aircraft, very realistic, good flying simulation and very challenging	$10.00
Jet Fighter Pilot — Takes you as close to real combat fighting as possible. A brilliantly realistic simulation	$19.95
Airmail Pilot — an entertaining game can you get the mail through in your 1927 Biplane, watch for lightening, windstorms, fuel shortages etc..	$10.00
Night Flight — a new exciting game from Instant Software	$12.50
Flight Path — from Instant Software	$12.50
Adventures — what more can be said! The most challenging simulation/game/adventure ever Nos. 0 to 9.	ea. $16.00
1 on Disc	$19.00
2 on Disc	$32.00
3 on Disc	$39.00
Backgammon/Keno — 2 great gambling games from instant software	$10.00
Mind Warp — A series of great programmes	$12.50
I.Q. Test — See how smart you really are	$12.50
Interactive Fiction — "Little Red Riding Hood" Computer adventures into the children's world of make believe	$17.50
Olympic Decathlon by Microsoft	**Disk $29.00; Cassette $29.00;**
Bandito — Your TRS-80 a slot machine with great sound effects	$12.50
Star Trek — Acorn a space adventure on your TRS-80.	$12.50
Stock Market — Invest in safe stocks or high risk specs. will you take the risk	$12.50
Original Adventure — requires 32K & disc from Microsoft.	$35
Monolopy — Play that famous game against the TRS-80.	$10
Time Trek — with sound, another of the 'classics' for the TRS-80 real time excellent programme	$21.00
Galactic Empire — a space game with a difference, many hours enjoyment with this one.	$16.00
Cosmic Patrol (with sound) — WARNING! Players of this game should be prepared for a state of realism hitherto unavailable on theTRS-80	$19.95
Light Pen — games and instructional program includes game frogs (Light pen not included)	$10.00
Space Battles — requires 32K 1 disc	$15.00
Games 20 — only 75 cents per program on disk	$15.00
Pinball — the greatest game that I have ever seen for the TRS-80, fast action movable flippers and great sound. Machine language, maintains high score	Disk. $20 Tape. $16
Super Space Invaders with Sound — nothing like the normal invaders extra fast. Spray bullets like out of a hosepipe, not only does the enemy move sideways but they also advance	Disk $20 Tape $16
Space War — A 2 pleyer real time space battle; 5 modes, 2 speeds	$12.50
Ultra Trek — A Star Trek theme in a challenging adult version	$19.95
Lying Chimps with Sound — a very interesting program	$10
Chessmate 80 — This programme forced a draw with Sargon 2	$24
Othello — An old favorite	$12.50
Typing Teacher —	$10
Your Cribbage & Checkers Partner	$12.50
Quad — A tic-tac-toe strategy game with a difference	$12.50
Zossed in Space - machine language, with graphics	$17.50
Interactive Fiction — "Local Call for Death" you actually take part in history	$22.95

PET

TREK X with sound (for R&T)	$10
Backgammon and Keno	$10
Space Trek 2.	$10
Code Breaker with sound	$17.40
Gammon Challenger — 3 levels of play	$17.40
Barricade — "Machine Language Arcade Game"	$10.00
Backgammon — Machine Language	$16.00
Some common basic programmes.	$17.50
Dungeon of Death	$10
Chimera	$12.50
Santa Paravia	$12.50

APPLE

Golf.	$10
Bowling - Trilogy	$10
Oil Tycoon.	$12.50
Sahara Warriors	$10
Space Wars.	$10
Air Flight Simulation.	$12.50
Santa Paravia	$12.50
Math Fun — Change an Apple computer into a mathematics tutor and change boredom into enthusiasm (all programs in this package run in Applesoft basic except whole space which requires Integer Basic)	$25
APPLE FUN comprising MIMIC, FLIGHT SIMULATION, COLOURMASTER, STARSHIP ATTACK and TRILOGY (Apple II or IIplus - 32K - 1 Drive - Mimic requires Applesoft in Rom)	$25

COMPUTER BOOKS

Basic Basic	$11.00
Advanced Basic	$11.00
Basic from the Ground up	$11.00
Basic Work-book	$7.50
Discovering Basic	$8.50
Common Basic Programs	$12.50
Sargon Chess	$19.00
How to Build a computer controlled Robot	$15.00
How to profit from your personal computer	$11.00
An Introduction to Microprocessors 0	$11.75
" " " " 1	$12.50
Z80 Programming for Logic Design	$12.50
Z80 Assembly Language Programming	$13.60
Pay Roll & Cost Accounting* *(Software to match $99)*	$20.00
Account Payable & Receivable* *(Software to match $99)*	$20.00
General Ledger* *(Software to match $99)*	$20.00
6502 Assembly Language Programming	$13.60
The 6800 Microprocessor	$11.00
Basic Microprocessors & the 6800	$16.00
Computer Mathematics	$16.00
Consumers guide to personal computing & Microprocessors	$11.00
Mini Computers, structure & programming	$18.00
Fundamentals & Applications of Digitallogic circuits	$13.00
Small Computer systems Handbook	$11.50
The first book of Microcomputers	$6.50
Computers in Society	$9.50
Computers in Action	$7.00
Standard Dictionary of Computers	$25.00
Programming Programmable calculators	$13.50
Cobol with style	$9.50
Basic with style	$8.00
Fortran with style	$9.50
Pascal with style	$8.50
Programming Proverbs	$9.50
Fortran Fundamentals	$6.50
Fortran 4 Programming	$9.00
Microcomputer System Design	$21.00
Microprocessor Data Manual	$10.00
Microprocessor Basics	$16.00
S-100 Handbook	$16.00
Digital experiments	$11.00
Digital Trouble Shooting	$12.50
Telephone Accessories	$7.50
More telephone accessories	$7.50
Logical Design Using IC's	$24.50
Statistical Pattern recognition	$21.50
Fundamentals of Data Base Systems	$21.00
400 Ideas for Design Vol 3	$18.50
Integrity & recovery in Computer Systems	$12.50
Management of Information Systems	$11.00
File Structure for On-Line Core Systems	$18.50
Data Management for On-Line Core Systems	$18.50
Digital Signal Analysis	$27.00
Computer Security Risk Analysis	$16.00
Character readers & Pattern recognition	$17.50
Modern Electronics Security Systems	$16.00
Printed Circuit Assembly	$6.50
Basic Mathematics Vol 1	$8.50
Vol 2	$8.50
Mathematics for Electronics	$9.50
Human Communication Handbook Vol 1	$12.00
Vol 2	$12.00
Computer Dynamics	$13.00
Computer Aided Design Techniques	$32.00
Electronic Game Projects	$6.00
TRS-80 Disk and other Mysteries "Pennington" *Now in stock.	$25.00

★ *NEW!! Z80 soft card $365.00 (run Z80 programs on your APPLE).*

DEFOREST SOFTWARE

The Floppy Doctor. Checks every sector of disk, motor speed head positioning, controller functions, status bits, etc.	$25.00
New DOS 80 — The latest and greatest from Apparat, variable length fields to 4K, mix and match drives on 1 cable. 18 to 80 track. Security boot and much more	$149.50
New DOS Plus — A very powerful disk operating system, too many features to list. Send SAE for reviews and information	40 track $110.00 35 track $99.00 77 track $120.00
New DOS — A scaled down version of the above	40 track $55.00 35 track $49.00
Editor Assembler Plus — Microsoft — Very powerful complete with de-bugger.	$34.00
Basic Compiler — Create fast Z80 code of your basic programs	$202.00
Level 3 Basic — get all the advantages of disk basic plus many extra features (disk or cassette)	$52.00
Assembly Language Package — Complete Marco Assembly by Microsoft.	$102.00
Fortran — Microsoft — Fully compatable with TRS-DOS	$102.00
Packer — Comes with 16K, 32K & 48K versions; perhaps the best program written in 1979; remove rems & spaces, renumber, move and more — Disk add $5.00.	$30.00
Clone 2 — Copies system or data tapes, make backups of your valuable programs.	$18.00
Print to L. Print — No Printer? Simply use this program to change all L. Prints to Prints or vice versa, other features.	$10.00
System Savers — FLEXI and T DISK put your favourite M/L tape to disk or make back-ups of system tapes.	$24.00
Tape based labelling disassembler — this program assigns labels (where appropriate) to the routines in a machine language program. The output is almost identical to hand assembled sources cose. Because of the use of labels, it is a simple matter to make changes without loosing track of jump/load addresses	$19.95
Disk-based labelling disassembler — as above but for disk systems.	$24.95
Utility 1 & 2 — from Instant Software — 2 tapes	

New DOS 80 — comes in a brown and gold blocked plastic cover with orange pages if your copy is different contact us or Apparat. It could be a forgery.

EDUCATION

SBT — Structure Basic Translator — write basic in a structured format	disk $23.00
Teacher — Create your own texts store on data file	$12.50
French/Italian/German — Each on disk, very powerful language CAI program.	each $23.00
Assembly Language Instruction Course — Audio cassettes, program cassette and reference book. Learn Assembly Language the easy way. This course guides you smoothly through the complexity of Assembly Language without difficulty.	$70.00

HARDWARE

Speed up now to 100% faster. Make your machine the fastest on the block (new improved model, now 4 speed)	$35.00
Coding Forms	2 pads $8.50
Flow Chart Pads.	5 pads $37.50
Giant Video Display Pads	5 pads $37.50
House brand 5¼ Diskettes	10 for $40.00
Blank Computer Cassettes	5 for $9.00 10 for $16.00
Data Separators	$39.00
Fine line graphics & lower case modification kit	$150.00
16K memory, 250ns	$57.00
Installation of above	$20.00
Installation of speed up mod.	$45.00
Level 2 Roms	$175.00
Installation.	$25.00
Lower case mod. (electric pencil type) Send keyboard via comet etc. We install	$45.00
Doubler — Double density for your machine	$250.00

OTHER PROGRAMS

Terminal features multi-protocol capability — auto repeat keys — true break key — soft keys, user programmable — forward or reverse scrolling — receive to disk file, printer or buffer.	$88.00
The Electric Paintbrush — A graphics language, very powerful	$21.00
Stimulating Simulations — from Personal Software	$21.00
General Mathematics	$12.50
CCA DMS — Data Base rep. 32K	Disk $95.00
MU MATH from MICROSOFT — a fantastic mathematic program	Disk $77.00
Azimuth Finder — Amateur Radio gives beam heading, call signs & distance for 100's of countries screen or printer	$14.00
Ham Package — Instant Software	$10.00
Music Tutor (Write music on your TRS-80)	$12.00
Opera by Acorn — got to be heard to be believed	$16.00
Engineers — Beam Analysis Program	$25.00
Common basic programs (matches Osborne book)	$17.50
Adventure 9 (Ghost Town)	$16.00

Don't boot-up without it!

The 'How To' book of TRS-80® data recovery

- **130 page, 8½ x 11 sortcover**
- **Actual memory maps, samples**
- **Detailed recovery instructions**
- **Recover lost programs, DOS errors**
- **Fix parity, gat and hit errors**
- **Recover from unreadable directory**
- **Fix Electric Pencil file errors**
- **Recover lost or killed files**

TRS-80 IS A REGISTERED TRADEMARK OF TANDY CORP.

JUST $22.50

Get it and unveil the many disk mysteries

Word Processing deForest Style

Using the best in word processing software the **Magic Wand**™, the best in letter quality printers the **DIABLO**, and the well-known **TRS-80**™ **MOD II.** You have looked and looked for the best and now it is available from the **Complete Computer Company, deForest Software.** Word Processing at its best from $10,400.

Magic Wand available separately for the MOD II and other computers $450.

Why buy a dedicated word processor when for less money you can have a complete computer system!!

deForest Software

26 Station Street, Nunawading, Vic., 3131. Phone.: (03) 877 6946

Magic Wand is a trademark of Small Business Applications, and TRS-80 is a trademark of Radio Shack.

other advantages, I ought perhaps talk a bit on the simpler (?) task of interfacing. Printers interface to their host computer via either a serial or a parallel interface.

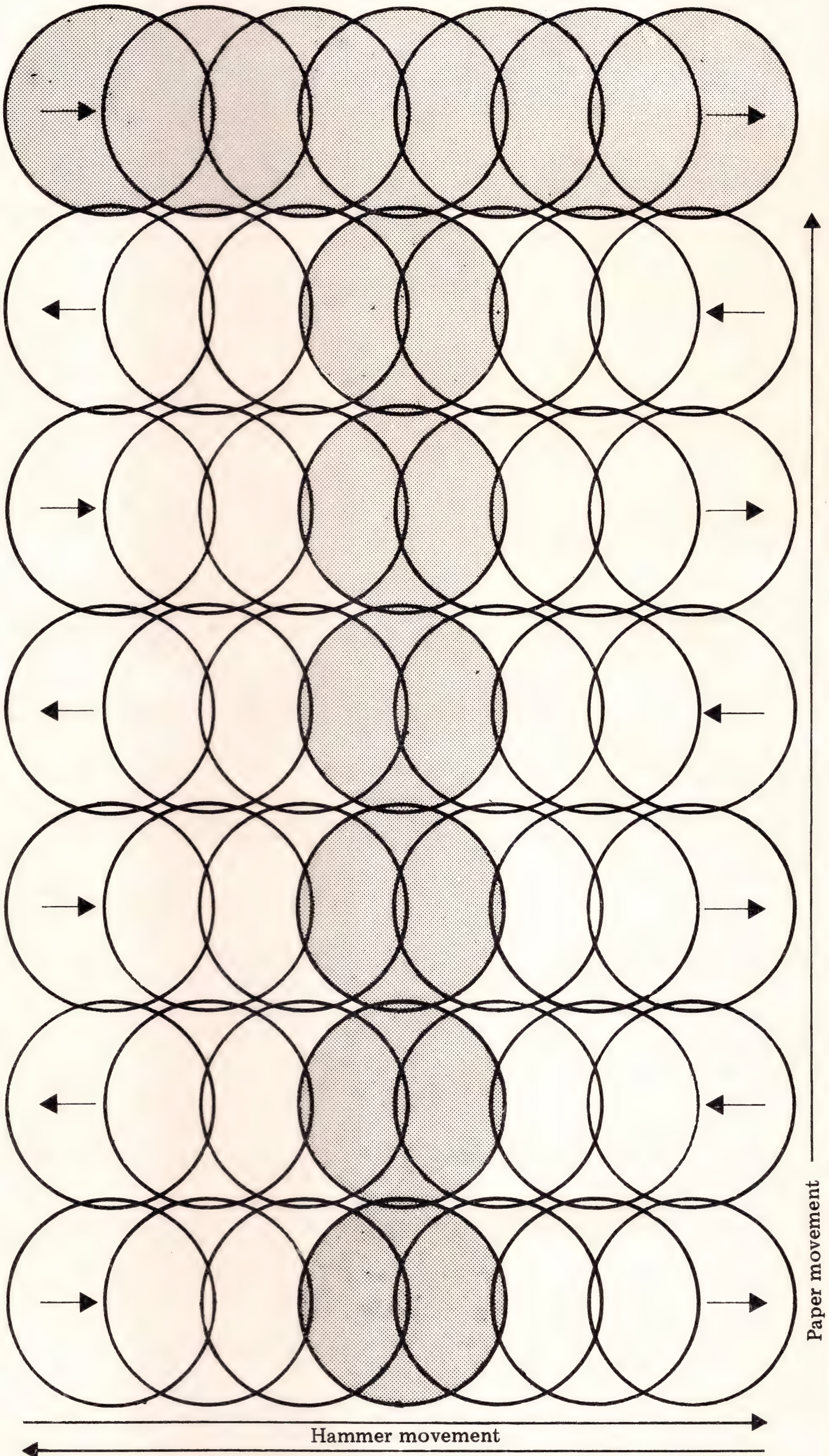
Because printer mechanics are much slower than electronics, many serial interfaces operate at a slow baud rate. Sometimes the maximum speed at which a printer will work (eg. 55cps) falls between two of the standard electronic baud rates — here, 300 and 600 baud. If the computer transmits at 300 baud then the printer is not being used at its fastest pace but at 600 baud, the speed is too high for it. The answer adopted by many manufacturers is to include a buffer (usually up to around 2k) inside the printer which will absorb occasional bursts at the higher rate without losing any characters. The problem of baud rate matching is still there and if the computer transmits a large chunk of data — eg. a listing — then the buffer will overflow in a very short time. If this type of operation is anticipated, it's important to make sure that whatever serial interface is used possesses a handshaking control that can inhibit the computer from sending any more data after the printer buffer has been filled up.

The proper answer is to use a parallel interface and there's a so-called standard — the Centronics interface. Many people advertise that they follow this standard but occasionally I have known people to run into trouble; certain elements within the interface didn't quite tie up as well as they should have — check therefore that your computer will interface satisfactorily. Handshaking is inherent in parallel interfaces and thus data transfer rate is not a problem.

Another aspect of control is the VFU or Vertical Forms Unit which uses tape cartridges, punched tape or microprocessors and ROMs to govern the vertical movement of paper. The simplest example is the 'forms-length' switch that tells the printer how many lines there are on the form, thus enabling it to move the top of the next form after the previous one has been printed. I refer, of course, to continuous stationery. Other, more sophisticated, VFUs allow movement to one of several predefined positions on, for example, an invoice. These might mark the head of form, the start of an address, the first item line and the total box. Some manufacturers even provide battery backup to maintain the forms information in the event of a power failure!! The whole trend seems to be to shift a lot of the intelligence associated with form presentation from the computer into the printer and to offer the user more and more flexibility; personally I think that too much flexibility can often confuse the issue.

The matrix printers also have a field day, thanks to microprocessor control. Apart from those facilities that I've already mentioned, there are other goodies such as the ability to change the number of characters per line or even to print double height, width or size characters; others allow multiple printing passes along the line to build up exotic characters. The enhanced matrix printers are heavily microprocessor controlled and perform many of these functions.

Word processing hasn't been ignored either as several printers will justify the text for you and proportionally space it. The principle behind proportional spacing is that for ease of legibility each letter doesn't occupy the same horizontal space. When allowance is made for this fact (ie. the print head doesn't move along the same amount for each character) the result looks much better.



Print sequence for 7 x 7 matrix

Fig 8

Conclusions

I hope the foregoing has given prospective buyers some help in finding their way through the printer jungle. If I could crystal ball gaze then I'd say hang fire for a while as I suspect there are some interesting printers lurking in the wings, particularly in the area of dual-purpose and enhanced matrix printers. My advice for buying is to take your time and to decide what exactly are your requirements before looking at *any* printers. That way you stand least chance of being swayed by all the frills and furbelows in your search for the printer that's right for you. Also important, of course, is that you buy at the right price.

Using the chart

You will find that many figures in the chart are approximate; you should therefore only use it as a 'broad-brush' outline for making a preliminary choice. Where options are available they are indicated and a brief word given on the facilities offered. Don't assume, because a feature is missing, that a particular printer hasn't got it. It may mean that it simply wasn't mentioned in the literature. The converse may also hold true. Another point to bear in mind is that many facilities are inter-related — such as selection of characters per line versus speed.

To repeat, this chart is by no means exhaustive although it certainly exhausted me preparing it!! Make a few preliminary selections, send for the actual literature and, armed with your new found knowledge, ask a few pertinent questions.

A few printer/keyboard combinations that are usually considered as being terminals are not included in the chart, the distinction in some cases being a bit nebulous.

	Anadex			Centronics						
Model	DP 8000	DP 9500	Base 2 M80B	700	701	702	703	704	730	737
Print mechanism type	DM	DM	DM	DM	DM	DM	DM	DM	DM	DM
Line or character	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR
Speed cps Max	112	200	80	60	60	120	180	180	100	80/
Speed cps Min		120								
Lines/min Max		200		90	120	260	370	400		
Lines/min Min		60		13	25	50	70	70		
Characters/line 80	▩		▩						▩	
Characters/line 132		▩	▩	▩	▩	▩		▩		
Characters/line other		175/220	72/96/120							
Characters/inch horizontal		10/16		10	10	10	10	10	10	
Lines/inch vertical		6/8	6	6	6	6	6	6	6	
Proportional spacing										
Bidirectional printing		▩	▩		▩	▩	▩	▩		
Justification										▩
Multiple copies										
Ballistic head										
Matrix format	7x9	7,9 or 11 x9	7x5	7x5	7x5	7x7	7x7	7 or 9x7 or 9x9	7x7	Nx9 or 7x
Change print size			▩					▩		
Change type font		▨	▩							
No. in character set			21					96	96	96
Headlife (million chrs)		100/650	100							
Descenders										
Underlining										▩
Ribbon life (million chrs) normal			5							
Ribbon life (million chrs) carbon										
Mobius loop type?				▩	▩	▩	▩	▩	▩	▩
Graphics		▩	▩							
Bidirectional movement										
Pin feed	▩									
Tractors			▨	▩	▩	▩	▩	▩	▩	
Dual tractor										
Paper widths Min									4	4
Paper widths Max									10	10
Friction feed			▩							
Sheet feeder										
Paper cutter										
Serial interface	▨	▩	▩					▩		
Max baud rate	9600	9600	19200					9600		
Buffer Opt.	▨ 2048		▨ 1920							
Buffer Fixed	12		▩					256	80	
Parallel interface	▨	▩	▩							
Parallel transfer rate (ch/sec)	1000									
Self-test			▩							
VFU				Operator Horiz. & controlled vert forms posn.				▩		
Switchable forms length	▩									
Punched tape										
8 Channel cartridge										
Electronic + No. channels										
Paper-out sensor	▩			▩	▩	▩	▩			
Measurement in inches width	19	27	14	25	25	25	25	25	15	15
Measurement in inches depth	14	15	10	20	20	20	20	20	11	11
Measurement in inches height	7	8	3	8	8	8	8	8	5	
Approx weight (lbs)		35	9	60	60	60	60	60	12	12
Cost	$950	$2000	$800	$2700	$2700	$3300	$4100	$4200	$1090	$140

Key:	
DM	Dot Matrix
DW	Daisy Wheel
DR	Drum
SW	Spin Wheel
GB	Golf Ball
CM	Comb
CH	Chain
PH	Print Head
P	Pressure Sensitive
E	Electro Sensitive
TH	Thermal
*	Half Space Facility
▨	Optional
░	Standard

Please note the prices shown are only approximate and may vary substantially between dealers.

						Diablo	Spinterm	Malibu	MEMEC	Newbear	OKI	
	779	780	781	791	Screen Image			165	NEC	8300	Microline 80	DP 125
	DM	DM	DM	DM	E	DW	DW	DM	DW	DM	DM	PH
	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR	L
/150	60	60	60	60		45	55	165	55	125	80	
								90				
	90	90	120	210							101	125
	21	21	43	45							21	
	░	░	░	░						░	░	
░	░										░	░
					40x24		136/163		136/163		40	
	10/16.5	10	10	10			10/12		10/12	10	10	
	6	6	6	6			6/8	▨		6	6/8	
						▨			░			
░			░	░		░	░	░	░			
						▨			░			
						14	5			3		4
								░				
	7x5	7x5	7x5	7x5				9x10			9x7	9x7
						▨		░	░	░	░	░
						▨		░	░			░
					Viewdata Teletext	96	128		128		96	96
											200	500
						░		░			No	░
						░		░				░
░	░	░	░	░								
						▨		░	░			
						░			▨			
						▨	▨	░	▨	░	▨	
░	▨	▨	▨	░		▨	▨	░	░		▨	░
						▨						
								3		5	3	4
							16	16		10	9	16
	░	░	░			░	░		░		▨	
						▨			▨			
						░	░	░	▨	▨	▨	▨
						9600	1200		1200			9600
						▨ 2304						▨ 2k
			Centronics Standard			256	256		256	80		132
ndard						░		░	▨	░	░	
						2000						
░		░							░			░
░	░	░	░	░				░	░			░
░	░	░	░	░			░	░	░			░
								░	░			▨ 12
░		░		░		░			░			░
	20	20	20		13			28	25	18	14	24
	18	18	18		10			19	16	15	10	33
	8	8	8		4			9	9	7	5	10
	45	45	45		10			48	60	20	13	77
00	$2000	$2100	$2400	$2600	$1100	$4300	–	–	$3700	$950	$1000	$4200

HY-Q 1000

The World's Most Intelligent Printer

Add super printing to your computer deal...the smart way .... for under $3000.

- Logic controlled by five microprocessors
- Non-volatile resident memory
- Automatic error correction (a single character to a complete line)
- Proportional Spacing (with 1/60 inch resolution)
- Pica size type at 10 characters per inch
- Elite size type at 12 characters per inch
- Mikron size type at 15 characters per inch
- 1, 1½, 2, 2½, 3, 3½ line spacing
- Software select:
  - Normal print
  - Normal print, underlined
  - Bold print
  - Bold print, underlined
  - Reverse print (white on black)
- Automatic carriage return at end of line
- Automatic storage of often used formats (tabs, spacing etc.)
- Automatic storage of often used phrases
- Multi-lingual keyboard standard
- Receive only printer
- Automatic column layout
- Through-put printspeed of 20 CPS (Minimum)
- 13.2 inch printing line
- 17" paper width capacity
- 132 columns at 10 characters per inch
- 158 columns at 12 characters per inch
- 198 columns at 15 characters per inch
- Automatic paper feed
- Built-in anti glare shield
- Accepts carbon or fabric ribbon cartridge
- Various color ribbons available
- Automatic centering of titles
- Automatic printing of VERTICAL lines (to separate columns)
- Automatic relocation key
- All printing elements Multi-lingual
- Automatic decimal point location
- Automatic carriage positioning
- Electronic digital readout to show:
  - Number of characters till end of line
  - Number of lines till end of page
  - An existing error condition
  - Selected automatic functions
- Switch selectable strobe, busy and acknowledge polarities on centronics 779 interface
- Signal light indicates when in upper case
- Switch and software selectable upper case/lower case normal
- Signal light indicates when in auto column layout mode
- Allows carriage return without line feed
- Allows line feed without carriage return
- Electronic tab set
- Electronic tab clear
- Electronic tab key
- Function to cancel all tab margin and spacing formats
- Electronic margin set
- Electronic margin reset
- Automatic backspacing of 1/10, 1/12, 1/15 or 1/60 inch
- Switch and software selectable auto carriage return and line feed on carriage return
- Automatic recall of often used formats
- Automatic recall of often used phrases
- 100 printable characters
- Electronic keyboard
- Daisy wheel printing element
- Noise reduction kit (factory installed)

COMPLETE WORD PROCESSING SYSTEM WITH 32K CBM, TWIN MINI FLOPPIES AND XYMEC FOR AROUND $8,000.

COMPUTERWARE, 305 LA TROBE STREET, MELBOURNE 3000.

TELEPHONE: (03) 602 1006

Key:

DM	Dot Matrix
DW	Daisy Wheel
DR	Drum
SW	Spin Wheel
GB	Golf Ball
CM	Comb
CH	Chain
PH	Print Head
P	Pressure Sensitive
E	Electro Sensitive
TH	Thermal
*	Half Space Facility
▨	Optional
▒	Standard

		Paper Tiger	Qume			Terminet			
Model		Paper Tiger	Sprint 5	M 80-MC	MT 1602	200	OMNI 820RO	OMNI 825RO	810
Print mechanism type		DM	DW	DM	DM	DM	DM	DM	DM
Line or character		CR	CR	CR	CR	L	CR	CR	CR
Speed cps	Max	198	55	200	160	200	150	75	150
	Min	57	45	140					
Lines/min	Max	275			200				
	Min	42			70				440
Characters/line	80	▒		▒					64
	132		▒	▨	▒		▒	▒	▒
	other	96/134	158	▨		136/224			
Characters/inch	horizontal	10/16		▨	10	10/16.5			10
Lines/inch	vertical	6/8		▨ 6	6				6/8
Proportional spacing			▒						
Bidirectional printing			▒		▒	▒	▒		▒
Justification			▒						
Multiple copies				5	5	8	5	3	6
Ballistic head						▒			
Matrix format		7 or 8x7		▨ 7x7*	7x7*	9x7	9x7	9x7	9x7
Change print size		▒	▒	▨	▨	▒	▨		
Change type font			▒	▨			▨	▒	
No. in character set		96	96	64	96		128	128	64
Headlife (million chrs)				〉100		100			
Descenders				▨					
Underlining									
Ribbon life (million chrs)	normal								
	carbon								
Mobius loop type?									
Graphics		▒	▒						
Bidirectional movement			▒						
Pin feed			▒	▒					
Tractors		▒	▨						
Dual tractor					▒				
Paper widths	Min	2				2	3	3	3
	Max	10				16½	15	15	15
Friction feed			▒						
Sheet feeder			▨						
Paper cutter									
Serial interface		▒	▒		▨		▒	▒	▒
Max baud rate			1200			120	9600	600	9600
Buffer	Opt.								
	Fixed	2048				2/256	1280	256	256
Parallel interface		▒	▨	▒	▒				
Parallel transfer rate (ch/sec)									
Self-test		▒		▒	▒		▒	▒	▒
VFU		▒	▒	▨	▨		▨	▨	▒
Switchable forms length		▒	▒	▒					
Punched tape				▨	▨ 2				
8 Channel cartridge									
Electronic + No. channels			▒		▒ 12				
Paper-out sensor		▒			▒		▒	▒	▒
Measurement in inches	width	16	24						25
	depth	13	15						20
	height	12	8						8
Approx weight (lbs)		20	44						55
Cost		$1000	$4000	$1950	$2600	$2800	$2800	$1900	$2900

AT LAST! A REAL COMPUTER IN KIT FORM

Real Computing Power available at kit prices

The Compukit 101 is a real computer — start with 4K RAM memory and full 8K Microsoft Basic in ROM. The Compukit 101 connects directly to your TV — just assemble, hit 'RETURN' and GO! A cassette interface allows you to use a normal cassette recorder to save and load programs.

Because the Compukit is available only as a kit, the savings are enormous.

Look at these features

* The Compukit 101 is based around the ultra-powerful 6502 microprocessor — best value and most powerful microprocessor.

* Steady clear picture using 50MHz refresh

* Display of 48 characters × 16 lines — 1K memory mapped video system providing high speed access to screen display for games and graphics.

* Extensive 256 character set which includes full upper and lower case, mathematical symbols, and graphics characters.

* Full 8K Microsoft Basic in ROM compatible with APPLE, PET, SORCERER programs — much faster than currently available personal computers.

* Video output and VHF high grade modulator which connects directly to the aerial socket of your TV set.

* Fully stabilised 5V power supply, including transformer.

Rugged construction

A full and detailed assembly instruction manual is included with the Compukit 101. Only the best materials have been used for this kit:

* High quality thru plated Printed Circuit Board with all I.C.s mounted on sockets.

* Clear, easy-to-follow layout. Simple soldering due to clear and concise instructions compiled by Dr. T. Berk.

* Professional 52 key QWERTY keyboard in 3 colours — software polled, meaning that all debouncing and key decoding is done in software.

* Absolutely no extras required.

Tested and Tried

The Compukit 101 is Europe's best selling computer kit, with good reason. And now it's available in Australia, fully modified for VHF television.

* Up to 8K RAM can be mounted on board. (4K RAM addition only $85).

* 40-line expansion interface socket on board for attachment of extender card containing 24K RAM and disk controller (Ohio Scientific compatible).

* RS232 interface on board for printer connection.

* Standard KANSAS CITY tape interface providing high reliability program storage — use on any standard domestic tape or cassette recorder.

If You Want to Learn about Computers, But Didn't Know which Machine to Buy, then this is the Machine for You

The Compukit 101 allows you to develop programs in either BASIC or machine language.

* The BASIC is the best BASIC developed: Microsoft are internationally recognised as the industry leader.

* Number range from 10^{-32} to 10^{+32}.

* Scientific functions (such as EXP(X), SIN(X), LOG(X), etc), string variables, string functions, subscripted variables.

* 6502 machine code accessible through powerful 2K machine code monitor on board.

No Extras Needed — Just Hit RETURN and Go

The Compukit 101 is available complete for $595. No hidden extras. Includes RF modulator, Power Supply, Manual, Sales Tax, Post and Packing.

FREE

FREE Sampler tape including powerful DISASSEMBLER and MONITOR with each kit.

FREE

FREE Space Invaders (8K) program with 4K RAM add-on if ordered with Compukit 101 kit.

To: MELBOURNE HOUSE (Australia) PTY LTD 24 Peel Street, Collingwood 3066, Victoria

Please send me

__Compukit 101 kit, including all parts, manual, RF modulator and power supply	$ 595.00
__Additional 4K RAM Memory (fits on board)	85.00
__Case for Compukit	80.00
__Assembler/Editor tape	25.00
__Screen Editor tape	6.95
__Space Invaders (8K)	14.95
I enclose cheque for	$

Name: ____________________

Address: ____________________

____________________ Postcode: __________

ANNOUNCING QUALITY SOFTWARE

TRS-80

ADVENTURE

ADVENTURE is incredibly complex, fascinating and challenging — it is like no other computer program you have ever seen. "Out of 50 programs reviewed, ADVENTURE was rated No. 1... highly recommended" — 80 Software Critique.

Defeat exotic wild animals to get treasures or work out how to get out of a quicksand bog — Nine different adventures now available — ADVENTURELAND, PIRATES ADVENTURE, MISSION IMPOSSIBLE, VOODOO CASTLE, THE COUNT, STRANGE ODYSSEY, MYSTERY FUN HOUSE, PYRAMID OF DOOM and GHOST TOWN.

16K $19.50 ea.

INVADERS PLUS

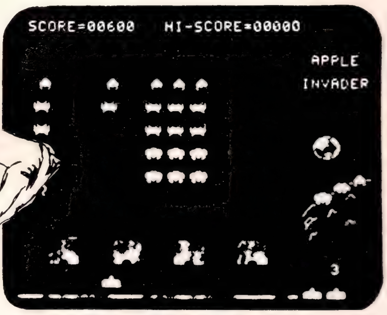
Written in machine language for rapid action, this is the best TRS 80 version of the Space Invaders video game: totally graphic and twice the speed of Alien Invaders; includes sound!! Nine levels of play from beginner to expert (almost impossible to beat at level 9).

16K $24.50

EDITOR ASSEMBLER PLUS

Plus what? Well you get the features of T-Bug and the original assembler/editor plus macros and conditional assembly, plus extra commands like substitute, move, copy and extend, plus Z-Bug a powerful debugging monitor with an 8 level breakpoint capability.

16K $39.50



To MELBOURNE HOUSE (Australia) PTY LTD
24 Peel Street, Collingwood 3066, Victoria

I have a .... microcomputer.

☐ Please send me your software catalogue. I enclose a stamped addressed envelope.

☐ Please send me ....
I enclose a cheque for $________ (plus $1 for post and packing).

Name: ____________________

Address: ____________________

____

__________ Postcode: __________

APPLE II

VISICALC

Hailed as the single most important piece of software, reviewed brilliantly in all the major magazines, VISICALC can do all your sales projections, cash flow, income tax, costing estimates, wages or engineering changes.

Includes book and step-by-step instructions for the complete beginner.

Cannot be recommended too highly. VISICALC alone justifies the purchase of an APPLE II!!

32K + DISK $195.00

ADVENTURE

All the brilliant adventures as for the TRS-80 (see above) now available for the APPLE.

32K $19.50 ea.

SUPER INVADERS

The video game that has swept the world now comes into your own home — this is the original Invaders game — original graphics and sound: 55 aliens advance and shower you with lethal arrows; as you shoot them they quicken their descent. Action twice as fast as other invader games.

32K $29.50

ZX-80

30 PROGRAMS FOR THE SINCLAIR ZX-80

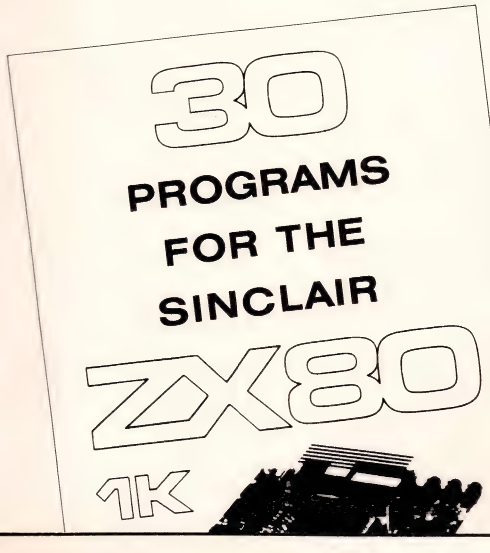
This unique book contains 30 programs all designed to fit in the 1K version of the Sinclair ZX-80!! With this book, you will realise that the ZX-80 is more powerful than you imagined.

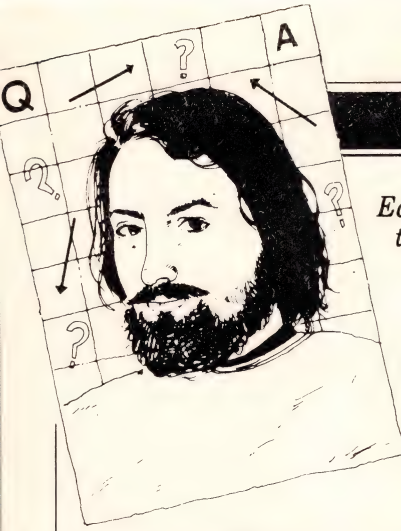
112 pages packed with information!

Programs include LUNAR LANDER, BLACKJACK, LINE RENUMBER, MEMORY LEFT, GOMOKU, NOUGHTS AND CROSSES, MASTERMIND, HORSE RACE, DR. ZX 80, LIFE and 20 others.

Illustrates all programming techniques including USR function, PEEKs and POKEs.

BOOK $12.50





COMPUTER ANSWERS

Each month Sheridan Williams and his panel of consultants answer readers questions. Topics may be hardware — from kits to mainframes, or software — from differential equations and statistics to file handling or sorting; the choice is yours.

Into the unknown

With regard to the Sinclair ZX80 and the Acorn Atom: (1) Would it be possible for a user to construct a printer interface for the ZX80 that's currently on the market? Which printers would be suitable?

(2) Would the fact that the ZX80 has a Z80 type CPU rather than the Atom's 6502 give the ZX80 any great advantage so far as the user is concerned?

L Wood.

I never fail to be amazed by what some people get up to! However, I shall assume in this case you mean an average user, without specialist electronic expertise, but with the ability to follow instructions carefully — and who can solder well.

Taking that as our basis, then I think I must answer 'no' to your first question. The ZX80 is indeed ingenious in offering the facilities it does — in a compact unit, and at a low price. However, this is achieved at the expense of a number of non-standard (perhaps I should say 'innovative') features. These combine to make the interfacing of a standard model of printer a difficult matter.

For a start, virtually all printers (apart from IBM ones, and Telex printers) use the ASCII character code. The ZX80 does not. That means you would have to use a lot of the ZX80 memory to contain a code translation program — or have another micro between it and the printer do to the job!

Secondly, the I/O routines make more than one use of some areas of memory (hence) the screen blanks out during keyboard input and program running) . . . therefore I/O routines are also non-standard.

And finally you need to buffer the bus lines before really contemplating connecting anything to them. I'm sure someone will soon prove me over-pessimistic by letting us know how they've attached a printer to a ZX80; for the rest of us it's a question of waiting for the special Sinclair printer to become available.

On your second question once again the answer really hinges around 'who is the user'. If you are only working in Basic (or some other high-level language) then there is really no noticeable difference in principle between machines using 6502s and those using Z80s. In fact, other things, such as the particular implementation of Basic used with your machine, will cause the most marked differences. The one that might show up is speed, and then only if the Z80 is a Z80A being run at a full 4 MHz. Even then, I sometimes wonder if a difference in speed of that order is significant to the typical amateur user.

Where the differences do show up is in machine code, or assembler language programming. Even then, while the Z80 has a more powerful instruction set, there are those programmers who prefer to work with 6502 assembler language. So, to sum up, the type of micro-processor used is unlikely to be significant in choosing between the Acorn Atom and the ZX80.

P McIlmoyle

Unadventurous games

I'm bored stiff with computer games that involve killing Klingons, Robots, Piranhas, Space Invaders, Androids, and who knows what else. I'm also bored with computer versions of chess, Othello, draughts, pontoon etc. What's next, other than suicide?

J James.

How about a game called 'Adventure'? There are dwarves, dragons, trolls, pirates, snakes and other nasties in this game and it's up to you whether you kill them or not. As you have this aversion to killing perhaps you could try 'stroking' them instead.

Adventure is a totally different type of computer game, unlike any that you will have seen already. Before you get too excited, there might not be a version available for your machine, and even if there were it would not be worth getting unless you had disks. Still we can dream; let's assume that it is available for your machine. Here's an analogy: If you think of most computer games as 'films' then Adventure can be likened to a 'book'. In a film you are given very little chance of fantasising, but with a book you can conjure up your own mental pictures. Adventure is like that. It is an adventure story that you can control, the object being to find your way into a cave system and collect lots of hidden treasure. The more you collect the greater your score. Along your journey a great many things can happen and you must find the correct course of action to proceed. Before you think 'yawn' I must tell you that when I tried Adventure it totally ruined a whole weekend. I started playing at 10am on Saturday and apart from about six hours' sleep, I was still playing at 1130pm on Sunday night! And I still only scored 200 out of 380. In other words, I had only covered just over one half of the cave system and this was only a small version of the game. The versions I have used are on a PDP11 and an RML 380Z. If you can get a copy then jump at the chance.

Sheridan Williams

Program puzzle

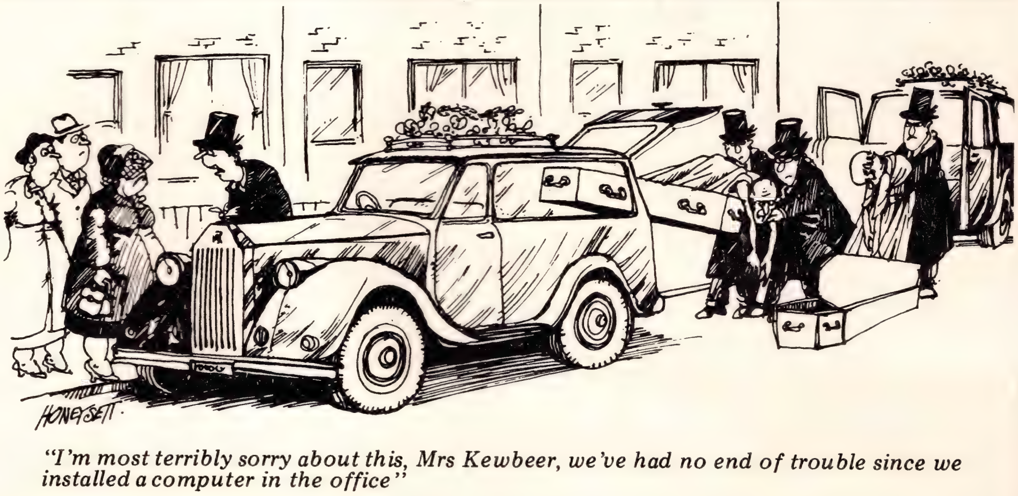
I've seen expressions like X=A AND 127 in programs and I can't work out what they are. Can you help? H Elliott.

You will need to know a little about binary and machine code to actually understand their purpose rather than just what it is they do. Essentially the statement above chops off the left-most bit of an 8-bit byte. The operators AND, OR and NOT are called logical operators. If 0 represents 'false' and 1 (on some Basics -1) represents 'true' then here is a table for the most commonly used operators:

A	B	A AND B	A OR B	A EQV B	A XOR B
0	0	0	0	1	0
0	1	0	1	0	1
1	0	0	1	0	1
1	1	1	1	1	0

There are others like NAND, NOR and IMP, but not many Basics support these. So, to answer your question; 127 in 8-bit binary is 01111111 and, if A has the value 10001111, then X=00001111. The expression you gave could be replaced by IF A>127 THEN A=A-128. You can try PRINT 143 AND 127 in the direct mode. Be warned, however some Basics do not support logical operators in arithmetic expressions.

SW



"I'm most terribly sorry about this, Mrs Kewbeer, we've had no end of trouble since we installed a computer in the office"

BENCH TEST

SUPERBRAIN

The early SuperBrain adverts seemed too good to be true — then subsequent delays in its reaching the market place sparked off rumours of trouble. Now that the SuperBrains are here, do they live up to those original ad claims? Sue Eisenbach investigates. . .

Hardware

The Superbrain QD is a single unit personal computer weighing approximately 23kg and with physical dimensions 54cm wide by 57cm deep by 37cm high. Both in appearance and weight it seems like a VDU and, in fact, Intertec do market several VDUs in the same, attractive, white and grey structural foam case. However, in performance terms, it is, of course, a far cry from the humble glass teletype. The top of the case is attached to the base by means of four securing screws. Inside, the system is seen to be divided into four self-contained modules — the keyboard/CPU; the disk drives; the shielded CRT and the power supply. All are easily accessible without further fiddling except for the disk drives which require the release of another two fixing screws (each) before they are detached and available for inspection.

The heart of any SuperBrain is the CPU/keyboard module. This contains two 4 MHz Z80As — one to handle the processor and screen I/O while the other takes care of disk I/O. The SuperBrain QD comes with 64k of dynamic RAM as standard (32 4116s) whereas an ordinary SuperBrain comes with 32k as standard but with sockets for another 32k. The machine also has 1k of static RAM for use by the second processor and 2k of ROM for bootstrapping at power-up. The rest of the board contains the character and keyboard encoder circuitry, the disk controller (FD1791) and the communication electronics — including two serial ports (switchable synchronous or asynchronous) which are under software control. Thus baud rate, parity, the number of stop bits and the transmission mode can be set from the keyboard. A 22-pin cable connector handles power and signals and a second 40-pin Z80A data bus connector is available for future exapansion. At the moment, according to the documentation, a Centronics compatible parallel interface can be connected directly to this bus. Also promised (but not yet available) is an S100 bus adapter to allow the attachment of a single S100 board inside the SuperBrain case, next to the disk drives.

The keyboard generates the full 128 ASCII character set. The 76 keys include a separate numeric pad with a

Computer Country Pty. Ltd.

"THE MICROCOMPUTER PROFESSIONALS"

Thinking of purchasing a microcomputer system or adding to the one you already have? Make a good investment – invest a little bit of time to talk to the professionals at Computer Country. Remember the quality of the after-sales hardware service and continual after-sales software and hardware advice you get is just as important as the price of the system you buy. Come and have a chat with the professionals of Computer Country just once and you'll realise how much help we can be in enabling you to get the most out of your microcomputer system.

Computer Country stocks a wide range of microcomputer hardware including the Apple, Northstar, Commodore, Texas Instruments, NEC, Impact Data and many more. We carry a wide range of software for many systems including the TRS-80. We can also help you in customising software for your specific application.

Our service department not only completely backs up all hardware purchased from us, but invites enquiries from those who have purchased elsewhere and have hard-to-fix problems.

MAKE A SMART MOVE – COME TO

Computer Country Pty. Ltd.

338 QUEEN STREET, MELBOURNE, VIC. 3000
Telephone: (03) 329 7533

SORCERER SOFTWARE

SYSTEM 2 by Richard Swannell, loads into the top of available RAM and becomes an integral part of the BASIC language. All commands are single keystroke. SYSTEM 2 is written in Z80 and provides the following features:

1. **SCREEN EDITOR.** Use the editor to insert, replace, delete or rubout characters in your BASIC program. Watch the line change on the screen! Gone are the days of typing in a whole line to change one character!
2. **FUNCTION KEYS.** SYSTEM 2 allows 12 keys to be programmed to represent one or more characters or up to several lines of text each! After a key is programmed, by simply hitting key, all the text is sent to the processor just as if you typed it in on the keyboard! Function keys may be used in all modes of operation, including the editor. This feature is handy for lengthy and/or often used commands and may include multiple statements.
3. **RENUMBERING ROUTINE.** With a single keystroke your program is renumbered. Starting line number and increment may be changed.
4. **BASIC BUFFER PROTECTOR.** SYSTEM 2 sends a (CR) when the BASIC BUFFER is full. This prevents BASIC from crashing.
5. **PRINTER DRIVER.** Simply hit CTRL P to direct output to Centronics printer.
6. **RIVIVAL ROUTINE.** If NEW or CLOAD are typed, or RESET is hit by mistake, your program may be recovered. This is a safety device.

OTHER FEATURES

- RUNSTOP stops execution until any other key is hit.
- CLEAR clears screen then sends a (CR). Hit CLEAR to start on 'new page'.
- CTRL characters such as ESC. LF and CLEAR don't return ?SN ERROR.
- RUB doesn't require the SHIFT key to be depressed. This quickens editing.
- Includes a Real Time Random Number Generator.
- Returns automatically to BASIC after TAPE CRC ERROR while CLOADing.
- Suppresses premature CRLF. Normally, if RUB is used extensively while typing in a BASIC line, the cursor will drop down to the next line before reaching the end of the current line. SYSTEM 2 prevents this.
- SYSTEM 2 requires 2K of memory and is available in 8, 16, 32 & 48K versions. **$35.50**

RS232 PRINTER DRIVER. Requires 250 bytes of memory and is relocatable. Suitable for MONITOR, STANDARD BASIC, WORD PROCESSOR PAC & DEVELOPMENT PAC. Stores each character in a buffer then sends the whole line at once, which solves timing problems. **$10.00**

COMBINED SYSTEM 2 & RS232 PRINTER DRIVER. SYSTEM 2 with the RS232 printer driver instead of Centronics printer driver. **$40.00**

LUNA LANDER. Written in Z80 and Basic and requiring 16K, LUNA LANDER uses graphics to the full. Land you craft on the moon in real time. But be careful to land softly, otherwise you will see your LANDER crumple before your very eyes! **$15.00**

SYSTEM SOFTWARE

1 Kent Street, Bicton, 6157 Australia

Program comes on cassette and includes full documentation. Specify size of RAM. Prices in Australian Dollars. Add $2 for overseas airmail.
SORCERER is a trade mark of **EXIDY INC.**

SOFTWARE

AUSTRALIA'S MOST COMPREHENSIVE CATALOGUE

SEAHORSE
supplies more than
470 programmes from:
MUSE / PROGRAMMA / MICROSOFT
MICROSENSE / LIFEBOAT
GEMSOFT
for the
APPLE
CBM 'PET'
TRS-80
SORCERER
$1.00 inc. p & p refundable with order
Please specify your computer.

SEAHORSE COMPUTER SERVICES
P.O. Box 47, Camden, N.S.W. 2570
Old S. Rd. Razorback, N.S.W.
Telephone: (046) 366 131

row of cursor control keys and an alpha-lock. A nice feature is the pair of red keys at the lower corners of they keyboard. When depressed singly these have no effect; when depressed together however, the system re-boots itself — a two-handed operation which makes an accidental re-boot very hard to do. The only way I could get the screen to clear was ^L^K^J (where ^ = 'control'), which is not ideal.

The CRT consists of a 30cm P4 phosphor tube mounted in an aluminium chassis whose screen displays 24 lines of 80 characters. The white characters on a grey background are composed of a rather cramped 5x7 dot matrix on a 7x10 character field. The result is that some of the lower case letters are somewhat unconventionally formed, especially those requiring descenders — the whole gives a vague 'ransom note' impression. The video circuit is mounted in the base of the CRT chassis and is easily accessible.

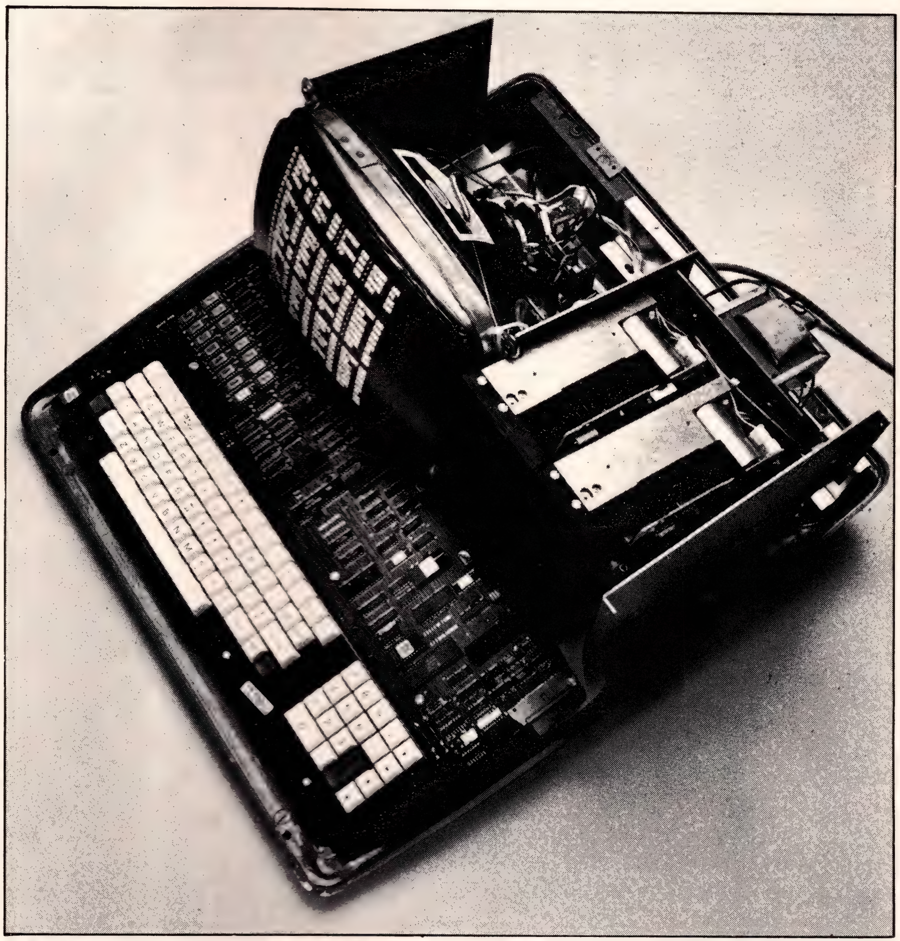
The SuperBrain QD is supplied with twin Shugart double-sided, double-density mini drives (Model 450) which on the review machine were completely reliable and noticeably quieter than single-sided drives. Each disk holds 338 kbytes formatted (700k unformatted) in G8 sectors at 512 bytes/sector — which makes the reading of normal 128 bytes/sector disks rather complicated. Average access time is 250 milliseconds (35ms track-to-track) with a transfer rate of 250 kbits/second from 300 rpm drives.

The 240 V power supply is fitted here. Bad placement of the transformers can cause a screen waver but the review machine's transformers were all fitted behind the drives and caused no discernible interference.

Software

The system boots in with
"64K SUPERBRAIN QUAD DENSITY DOS VER 3.0 FOR CP/M 2.2"
at the top of the screen. Along with CP/M 2.2, the review machine was supplied with both the compiler and interpreter for Microsoft's MBasic 5.0, Digital Research's new PL/1 compiler, SORCIM Pascal/M and Wordstar. SuperBrain's operating system contains several utility programs to deal with, for instance, the conversion of 128 bytes/sector disks to the 512 bytes/sector required by the latest DOS system. I never actually succeeded in getting this one to work — the program always failed with a 'disk not ready' message, so it can't be as straightforward as it seems and certainly more complex than on some other machines I have used. The two serial ports, on the other hand, can be easily re-configured by means of the program CONFIGUR, whereby the baud rate, parity etc. can be changed simply by selecting the required value from a menu.

PIP contains two functions, INP and OUT, which, according to the manual, allow the SuperBrain to be connected (and to behave as a dumb terminal) to another computer or to permit the transfer of ASCII or Hex files between the two machines. After some hours of struggling to make the connection with an LSI 11 according to the manual, I discovered that an extra signal was required to make contact with the SuperBrain.



A trepanned SuperBrain — note the heavy shielding between CRT and disk drives.

Once that was accomplished I had no trouble connecting up and transferring files from the LSI 11 to the SuperBrain via INP.

There is a size limitation of 25k per file and this must contain all the dialogue between the keyboard and the remote processor, as well as the file data itself. It is, of course, necessary to edit this dialogue out to return the file to its original state. I was also able to use the SuperBrain as a dumb terminal via INP, although the SuperBrain was not as dumb as I would have liked. The connection could be broken for instance by rapidly striking one or more of the keys, in which case PIP was liable to abort. Fortunately, upon re-connection, everything was usually all right. Another way to break the connection was to attempt to list rubbish (e.g. a binary file) on the screen in which case PIP again would abort, but the LSI would continue listing out to nothing.

OUT should have enabled the transfer of files from the SuperBrain to the other machine. After failing to get this to work, I was informed that this version of OUT contained a bug, the patch for which was still on its way from America.

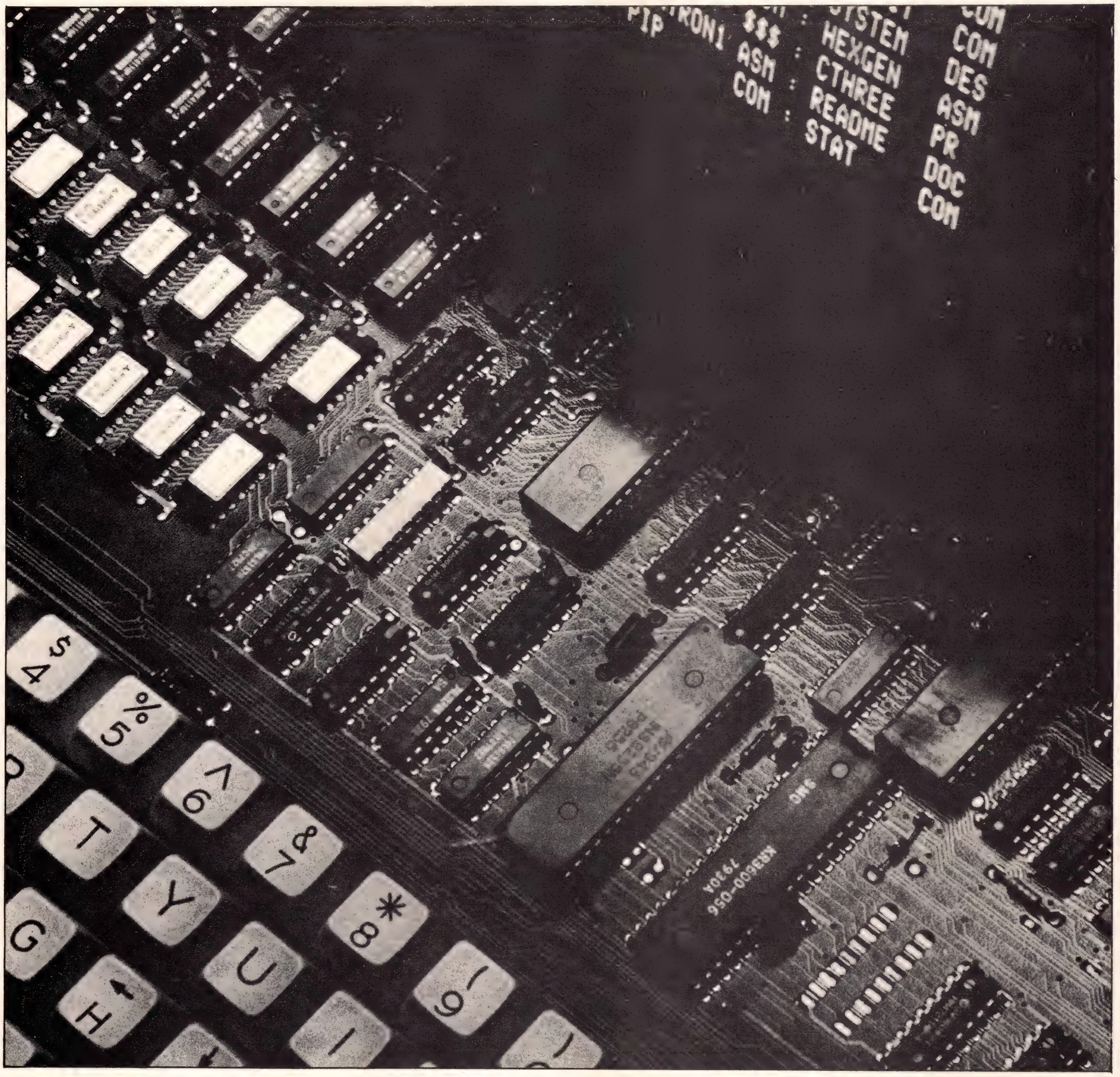
The BIOS portion of DOS is provided as a source program to simplify modifications to the peripheral drivers.

The latest Wordstar contains the nice feature of displaying a directory listing just before you load the file in, so that forgetful operators can remind themselves of the precise name of the file they require without having to return to operating system level. You can also switch disks (the 'logged — in disk') without leaving Wordstar — so that you could keep all the text files on one disk, and Wordstar itself, write-protected if necessary, on another. Long sessions could ensue without ever leaving Wordstar or having to re-set all those editing parameters — the package becomes more like a full operating system every time I use it!

Pascal/M is a fairly large Pascal compiler requiring at least 56k of memory

Technical Data

CPU:	2 Z80A 4 MHz
Memory:	64k dynamic RAM, 1k static RAM, 2k ROM
Keyboard:	76 keys, full ASCII
Screen:	12" white on grey
Cassette:	N/A
Disks:	2 drives, 5¼" double density, double sided
Printer:	N/A
Bus:	Z80A 40-pin data bus
Ports:	2 serial
System Software:	CP/M
Languages:	Basic 80, PL1, Pascal/M, 8080 assembler



and compiling to pseudo-machine code (p-code). This implementation is 'extended' using UCSD and the definition of ADA for guidance. Such extensions include SEGMENTation, STRINGs and string functions, untyped files, an extended character set for identifier names, direct access files and a random number generator.

Digital Research's PL/1—80 is the first implementation of PL/1 on a micro that I've seen. It is based on the ANSI General Purpose Subset (Subset G). The subset G does not include the following attributes or functions: DEFINED, FLOAT, DECIMAL, LIKE, PICTURE, FILE (allowed only in an OPEN statement), asterisk extents, dynamic arrays, ATANH, DATE, STRING, and TIME VALID; while the following features have been added: %REPLACE, READ and WRITE for variable length ASCII records, GET EDIT extended to full record input in a format, intrinsic functions ASCII and RANK. In order to run a PL/1 program it must first be compiled using a three-pass compiler which produces relocatable machine code, and then linked with the runtime subroutine library before it can be executed.

Potential

With its neat, integral appearance and CP/M operating system, the SuperBrain was designed to fit into a commercial environment. Other than Wordstar, I was not supplied with any application software on the review machine although plenty of CP/M software is available. I was lent a manual for Data Star, a filing system which permits the entry of information via forms on the screen, with range and format checking, into a file with multiple keys. According to its documentation, Data Star allows a user to select records satisfying given criteria and can be used in conjunction with programs in most languages.

Either the second serial port or the Centronics compatible connector can be used to interface a printer to the SuperBrain and that about exhausts the physical enhancements possible on the single stand-alone machine. Although this is not necessarily a limiting factor — 64k RAM and 680k storage constitute a pretty respectable micro-offering in the commerical environment — Intertec's plans to provide a link-up capability through the Compustar and the machine's ability to behave like a terminal of arbitrary intelligence, make the SuperBrain a reasonable prospect for any multi-user or distributed processing application. I particularly liked the fact that the multi-user system allows for the sharing of expensive perhipherals without overloading either the processors or the data-bus — a mistake which some of Intertec's competitors have made to their cost.

As an intelligent terminal in a distributed processing system, the SuperBrain certainly has the right looks and it is compact, about the same size and shape as a fairly standard VDU. Unfortunately, the review machine did not have all the software necessary to turn it into a robust, truly intelligent terminal.

Looking at the machine from an educational viewpoint, it has some limitations. I suspect that the case

Don't play games with your company's money.

Our entry level computer system is the first step in a full range of computer products. Not the last step in a full range of computer games.

We call it VIP. The Vector Intelligent Partner. And with a price of just $4200, you can't get more computer for your money.

VIP has all the assets and none of the liabilities of other entry level systems. It starts off with a lot more disk capacity. It has the same computational power, uses the same software as our larger systems, and can be upgraded at any time. So you avoid the expense of new hardware and software when you outgrow your current system.

You'll be able to do low cost word processing, mail list sorting, database management and accounting. You can even do software development.

VIP is perfect for salesmen, real estate brokers, insurance agents, small business owners and corporate department heads.

Because at Vector, improving your business is the best way to improve our business.

VECTOR

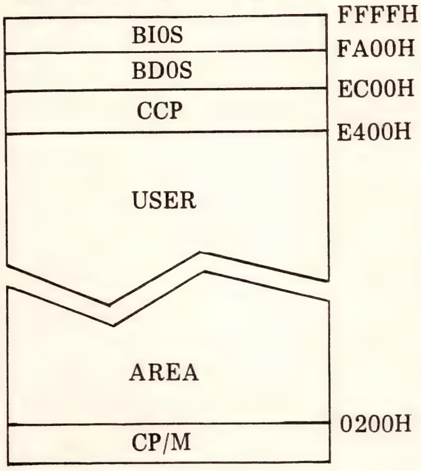
Economy Sized Computers™

Australian Distributor

DICKER DATA PROJECTS Pty Ltd

31 Cawarra Road, Caringbah NSW 525 4707 524 5639 Telex 70182

Memory map



Bench marks

BM1	1.56
BM2	5.25
BM3	14.01
BM4	13.91
BM5	14.77
BM6	26.26
EM7	43.24
BM8	5.56

Disk Tests

D1	0.95
D2	16.41
D3	26.35
D4	14.41
D5	13.02

All times in seconds

would rapidly become fairly shabby after a period of being humped from room to room and bashed about in 'normal' school use. Although the screen is memory-mapped and the user can therefore direct characters to any desired screen-position, there is no graphics capability as such, and there appears to be no obvious method of adding this feature — which is so desirable for the teaching of programming, for Computer Aided Learning and for good computer games. The SuperBrain is also a very unlikely laboratory tool as the only possibilities for interfacing are through the two serial and single (optional) Centronics parallel port.

Expansion

The review machine was fully expanded — a minimal SuperBrain has 32k RAM and two single-sided, double-density drives (340k total). Intertec Data Systems showed two expansion products at the NCC. The first was the Z80A to S100 bus converter which will allow a single S100 card (for example a hard disk controller) to be installed in the case and thus be built into the system. The second way to expand the SuperBrain is to turn it into an intelligent terminal operating in a multi-user system. Intertube has announced the Compustar multiuser system in which up to 15 SuperBrains can be connected to a master processor which controls access to hard disks and printers, etc. The drives will be Century Data Systems 20 Mbyte Winchesters, or CDC 32 Mbyte or 96 Mbyte cartridges. According to the sales brochures, up to four Compustars can be connected to the same cartridge drives. We await developments with interest. . .

Neat and simple. . . rear view of the SuperBrain.

Documentation

The review machine came with a large SuperBrain user's manual, plus six others. The user's manual looks like a mail-order catalogue, complete with thumb-index. After the first few pages of advertising, a table of contents is reached wherein are listed the names of all the standard software manuals available within a CP/M system with Basic 80, plus several sections devoted to the SuperBrain. I found this format much easier to use than the dozen or so independent manuals in a ring binder which one has come to expect from the (better) firms. I was not that impressed however by those sections produced by Intertec themselves. Firstly, they document an ideal system rather than the system that actually exists, and secondly, they tend to gloss over the details which might pin the manual down to one particular SuperBrain specification.

The other manuals provided were for Pascal/M, Wordstar, Data Star and PL/1 (three manuals). The Pascal/M manual has a table of contents, is paginated, indexed and clearly written. It is not a Pascal manual however (since Jensen and Wirth have written one which every Pascal user presumably possesses), but rather a description of how to use Pascal/M in particular, and how it differs from 'standard' Pascal. The —Star manuals are comprehensive but are rather turgid with fairly heavy-handed descriptions of the various processes and procedures — a shame since the programs are really very good.

The three PL/1—80 manuals comprise a language manual, Link-80 operator's guide and an applications guide. They are all paginated and have detailed tables of contents. All are in the same, concise, in-house style as the CP/M manuals. The language manual defines the language but without giving any examples. The Link-80 operator's guide has chapters on the linkage editor, relocatable macro assembler, the librarian, interfacing conventions and runtime subroutines. The applications guide is a tutorial book which provides the examples required to learn PL/1—80.

Conclusion

The SuperBrain is a compact, attractive 'single-box' computer, containing two Z80As and running under CP/M. It's competitively priced in relation to other mini-floppy, Z80A, CP/M systems. It doesn't contain a number of slots for a variety of different boards, so in that sense it hasn't the versatility of some of its competitors. However, its big plus is that it's an integral, stand-alone system.

It has some lovely touches, like the programmable serial I/O ports and the two-button re-set, and apart from some reservations regarding the software which controls the data transfer to another processor, I found the SuperBrain completely reliable, a pleasure to use, and very impressive with the new, quiet double-density, double-sided drives.

At a glance

FIRST IMPRESSIONS	
Looks	****
Setting up	****
Ease of use	****
HIGH LEVEL LANGUAGES	
Basic	****
Cobol	N/A
Fortran	N/A
Pascal	****
PL/1	****
PACKAGES	
Business	N/A
Education	N/A
Home	N/A
PERFORMANCE	
Processor	****
Cassette	N/A
Disk	****
Peripherals	N/A
EXPANSION	
Memory	*
Cassettes	N/A
Disks	N/A
Bus	**
COMPATIBILITY	
Hardware	**
Software	****
DOCUMENTATION	***
VALUE FOR MONEY	****

NOT DESIGNED FOR MUSIC

THE TROUBLE WITH TRS-80's

We like Tandy's home computer. At 16K Level II stage it is a reliable and reasonably priced entry to the magic of computers. But that cassette!

Tandy's optional "glitch kit" makes it fairly dependable, but it's still slow, requires knob twiddling for volume level and button pushing for operation.

Enough to put you off computers!

TANDY's ANSWER

Of course Tandy has an answer, add an expansion interface and a small disk drive.

Ask the price!

ASP's ANSWER

Now we have an alternative, and its not just a matter of offering a non-standard small disk drive a little cheaper than Tandy with the attendant risk if it doesn't work.

STRINGY FLOPPY

The solution is a compact high-speed tape transport system entirely under the control of the computer - designed for data - not music. Its called STRINGY FLOPPY

There are no controls to fiddle with, just one light indicating the drive is in operation and another indicating that data is being written onto wafer. It simply plugs into the back of the Tandy keyboard unit. Or with an optional adaptor into the System 80 Computer sold by Dick Smith.

WAFERS - NOT CASSETTES

Unlike the cassette recorder that comes with the Tandy, STRINGY FLOPPY uses specially designed "wafers" about the size of a credit card and 5 mm. thick. These contain an endless loop of special chromium dioxide tape ranging in length from 1.6 to 23 metres. Their low mass means they operate reliably at high speed.

Removal of a reflective label protects them against accidental overwriting of data.

Their special tape and the digital recording method used means you don't lose data.

RELIABLE RECORDING

STRINGY FLOPPY uses a true digital recording technique like floppy disks, not fluctuating audio tone. The result - RELIABILITY.

The system was designed for computers - not designed for music.

NO MAINTENANCE DRIVE UNIT

The STRINGY FLOPPY wafer has the pressure roller for the capstan built in. So the capstan and the record head can be fixed in the die-cast aluminium drive. No adjustments required. The wafer just slides into the drive and "clicks" home. No other mechanical motion is required. And because wafers contain endless loops, the tape always travels in the same direction.

There is no need for a rewind capability.

Simplicity means reliability.

INTEGRATION TO THE TANDY

All this would be useless if STRINGY FLOPPY wasn't easy to use. So its operating system is in a permanent memory chip (ROM) in the drive unit. Using the SYSTEM command it becomes part of the Tandy. 14K of ROM instead of just 12K. Commands allow you to initialize wafers (prove their integrity), load or save up to 99 files on a wafer on up to 8 STRINGY FLOPPY drives connected to the Tandy.

Programs can be in BASIC or machine language. Loading the 1K DATA I/O program from wafer adds additional commands to store and retrieve data rather than programs.

SPECIAL BONUS

Those who know their Tandy's well will know all about the dreaded keybounce! Well, STRINGY FLOPPY's ROM contains a keybounce fix routine. Nice?

RECORDING SPEED DENSITY

STRINGY FLOPPY records at 7200 baud (700 characters per second), 14 times faster than Tandy's cassette on a Level II machine. Tape speed is 25 cms. per second, so you can calculate access and loading times. If you "hot-up" your Tandy by increasing the clock speed you will get a proportionate increase in data density and therefore wafer capacity.

Even on a standard Tandy you can fit up to 64K on a 23 metre wafer.

PROGRAMMING

With STRINGY FLOPPY you can create programs which chain under the control of your computer. The pressure on memory diminishes. ASP has programs such as its word processor and a data base manager which can demonstrate the possibilities for clever creative programming.

THE CATCH

OK, the bottom line. STRINGY FLOPPY complete with operating system, plug pack power supply, DATA I/O program is $350.00 including Sales Tax. Add $5.00 for freight within Australia.

And we'll include a box of 10 mixed length wafers (normally $35.00) and a 2 for 1 bus extender (normally $20.00) in the price.

And a six month limited warranty.

And a year's subscription to our STRINGY FLOPPY Newsletter.

AND if you're not satisfied with STRINGY FLOPPY, return it within two weeks for a courteous refund (this applies only to non-Bankcard purchases).

So maybe there wasn't a catch.

BANKCARD orders must quote full Bankcard number, Expiry Date and be signed.

Versions for other computers are available.

ASP

MICROCOMPUTERS

797 DANDENONG ROAD,
EAST MALVERN 3145.
VICTORIA AUSTRALIA.
Telephone: 211 8855 211 8344

NEWCOMERS-START HERE

What follows is a brief guide for the microcomputing novice. It has been designed for quick reference — with all the key words in bold type; of course if you're feeling adventurous, you're welcome to read it right through. Whichever way, we trust you will find it helpful. Happy Microcomputing!

Welcome to the confusing world of the microcomputer. First of all, don't be fooled; there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say "numbering system with a radix of sixteen in which the letters A to F represent the values 10 to 15" when instead we can simply say "hex". No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, APC will be publishing this guide — every month.

We'll start by considering a microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, processing it, storing the results or sending them somewhere else. All this information is called data and it comprises numbers, letters and special symbols which can be read by humans. Although the data are (yes, it's plural) accepted and output by the computer in 'human' form, inside it's a different story — they must be held in the form of an electronic code. This code is called binary — a system of numbering which uses only 0s and 1s. Thus in most micros each character, number or symbol is represented by eight binary digits or bits as they are called, ranging from 00000000 to 11111111.

To simplify communication between computers, several standard coding systems exist, the most common being ASCII (American Standard Code for Information Interchange). As an example of this standard, the number five is represented as 00110101 — complicated for humans, but easy for the computer! This collection of eight bits is called a byte and computer freaks who spend a lot of time messing around with bits and bytes use a half-way human representation called hex. The hex equivalent of a byte is obtained by giving each half a single character code (0—9,A—F): 0=0000, 1=0001, 2=0010, 3=0011, 4=0100, 5=0101 ...... E=1110 and F=1111. Our example of 5 is therefore 35 in hex. This makes it easier for humans to handle complicated collections of 0s and 1s. The machine detects these 0s and 1s by recognising different voltage levels.

The computer processes data by reshuffling, performing arithmetic on, or by comparing them with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in memory as bytes. The rules are called programs and while they can be input in binary or hex (machine code programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the **programming language** is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is Basic. Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To run such a program the computer uses an interpreter which picks up each English-type instruction, translates it into machine code and then feeds it into the **processor** for execution. It has to do this each time the same instruction has to be executed.

Two strange words you will hear in connection with Basic are PEEK and POKE. They give the programmer access to the memory of the machine. It's possible to read (PEEK) the contents of a byte in the computer and to modify a byte (POKE).

Moving on to **hardware**, this means the physical components of a computer system as opposed to software — the programs needed to make the system work.

At the heart of a microcomputer system is the central processing unit (CPU), a single microprocessor chip with supporting devices such as buffers, which 'amplify' the CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board (PCB) or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large, PCB; in others a bus system is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function — for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the S100.

The CPU needs memory in which to keep programs and data. Microcomputers generally have two types of memory, RAM (Random Access Memory) and ROM (Read Only Memory). The CPU can read information stored in RAM — and also put information into RAM. Two types of RAM exist — static and dynamic; all you really need know is that dynamic RAM uses less power and is less expensive than static, but it requires additional, complex, circuity to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called PROMs (Programmable ROMs) and EPROMs (Eraseable PROMs) which can be programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, cassettes and floppy disks are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and play back information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, floppy disks are used on more sophisticated systems.

A floppy disk is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disk, in its protective envelope, is placed in a disk drive which rotates it and moves a read/write head across the disk's surface. The disk is divided into concentric rings called tracks, each of which is in turn subdivided into sectors. Using a program called a disk operating system, the computer keeps track of exactly where information is on the disk and it can get to any item of data by moving the head to the appropriate track and then waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts: soft sectoring where special signals are recorded on the surface and **hard sectoring** where holes are punched through the disk around the central hole, one per sector.

Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. Hard disk systems are also available for microcomputers; they store more information than floppy disks, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit (VDU), which looks like a TV screen with a typewriter-style keyboard; sometimes these are built into the system, sometimes they're separate. If you want a written record (hard copy) of the computer's output, you'll need a **printer**.

The computer can send out and receive information in two forms — **parallel** and **serial**. Parallel input/output (I/O) requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, with a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as the baud rate and, very roughly, the baud rate divided by 10 equals the number of bytes being sent per second.

To ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces; the most common is RS232 (or V24) while, for parallel interfaces to printers, the Centronics standard is popular.

Finally, a modem connects a computer, via a serial interface, to the telephone system allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need Telecom's permission; instead you could use an acoustic coupler, which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system — Telecom isn't so uppity about the use of these.

AUSTRALIAN
Personal
Computer

READER SURVEY

Win a computer in this year's reader survey! Yes, once again we have a Sinclair ZX80 to give away to the first name out of the hat. You don't even have to say nice things about APC – simply fill in the questionnaire on the next two pages, pop it into a (stamped) envelope and sent it along to our office.

Apart from the star prize, we shall be giving away annual subscriptions to the next 10 names out of the hat. Don't worry – if you already have a subscription we'll simply continue supplying APCs for a year from the expiry of your current one.

Perhaps we should explain why we are to conduct this survey each year – it is the only systematic way we have of getting your reactions to the magazine. We obviously meet readers and receive letters from you throughout the year but we shouldn't really form judgements on these necessarily brief encounters. By analysing a survey we are much better able to plan the contents of APC to reflect your real needs and tastes.

Another aspect of the survey concerns itself with the type of person that reads APC. This is also quite necessary because our advertising department describe our audience to potential advertisers, without whom there could be no APC – unless we could persuade around 10,000 of you to part with about five dollars an issue!

So there you have it – in order to give you the best possible service and to give you a special opportunity to influence APCs direction, we ask you to fill in the questionnaire without delay. The Grand Draw will take place in mid-December, just in time for the lucky winner to take the Sinclair ZX80 home for Christmas.

Once again, our thanks to Sinclair Equipment Australasia for donating the machine and our thanks to you for completing the questionnaire.

The first Sinclair ZX80 programming competition has been won by John Tonkin of Heathpool, South Australia with a 1K Basic simulation of a simplified microprocessor. Next month we'll be publishing John's program along with another five entries we thought worthy of a complimentary year's subscription to APC.

Please use BLOCK CAPITALS throughout and/or tick appropriate boxes

1 Name: ________________________________

2 Address: ________________________________

____

3 Age group: under 18 ☐1 18-30 ☐2 31-45 ☐3 46-65 ☐4 over 65 ☐5

4 Sex: M ☐1 F ☐2

5 Occupation: ________________________________

6 If you work full-time in the computer industry, please complete the following; otherwise GOTO question 8:

Please indicate your *main* area of involvement: Mainframes ☐1 Minis ☐2 Micros ☐3

7 If you ticked 'Micros' above, please complete the following; otherwise GOTO question 8:

Please indicate your *main* area of involvement: Software development ☐1 Hardware development ☐2

Sales ☐3 Servicing ☐4 Other ☐5

8 Which of the following publications do you read?

	Regularly	Occasionally	Please indicate which *one* you think's best
Australian Personal Computer	☐1	☐2	☐1
Pacific Computer Weekly	☐1	☐2	☐2
Australasian Computerworld	☐1	☐2	☐3
Modern Office & Data Management	☐1	☐2	☐4
Com 3	☐1	☐2	☐5
Electronics Australia	☐1	☐2	☐6
Electronics Today International	☐1	☐2	☐7

9 Please indicate your interest in the following sections of APC

	A lot	Some	Little	None		A lot	Some	Little	None
Newsprint	☐4	☐3	☐2	☐1	Micro Chess	☐4	☐3	☐2	☐1
Benchtest	☐4	☐3	☐2	☐1	Computer Games	☐4	☐3	☐2	☐1
Computer Answers	☐4	☐3	☐2	☐1	Newcomers Start Here	☐4	☐3	☐2	☐1
Interrupt	☐4	☐3	☐2	☐1	Gateways to Logic	☐4	☐3	☐2	☐1
Checkout	☐4	☐3	☐2	☐1	Face to Face	☐4	☐3	☐2	☐1
Bookfare	☐4	☐3	☐2	☐1	In Store	☐4	☐3	☐2	☐1
Programs	☐4	☐3	☐2	☐1	User Groups Index	☐4	☐3	☐2	☐1
Leisure Lines	☐4	☐3	☐2	☐1	Hardware Features	☐4	☐3	☐2	☐1
Yankee Doodles	☐4	☐3	☐2	☐1	Software features	☐4	☐3	☐2	☐1
Communications	☐4	☐3	☐2	☐1	Advertisements	☐4	☐3	☐2	☐1

10 What other topics would you like to see in APC? ______

______

11 What topics would you like to see deleted? ______

______

12 Are there any other comments you would like to make about APC? ______

______

13 Do you use a programmable calculator? Yes ☐1 No ☐2

14 If your answer to 13 was no, GOTO question 16; otherwise please state which make of calculator you own ______

______ and state the main application for which you use it

______

15 Do you use a programmable calculator:
– because it suits your application better than a micro ☐1
– or because you can't afford a micro even though you might prefer one ☐2

16 Do you own a microcomputer?
Yes ☐1 No ☐2 If yes, which make? ______

17 Do you own disk drives(s)?
Yes ☐1 No ☐2 If yes, which make? ______

18 Do you own a printer?
Yes ☐1 No ☐2 If yes, which make? ______

19 Do you intend buying a microcomputer during 1981?
Yes ☐1 No ☐2 If yes, which make? ______

20 Do you intend buying disk drive(s) during 1981?
Yes ☐1 No ☐2 If yes, which make? ______

21 Do you intend buying a printer during 1981?
Yes ☐1 No ☐2 If yes, which make? ______

22 What is your intended total budget for the above purchases?
$999 ☐1 $1000 – $1999 ☐2 $2000 – $2999 ☐3 $3000 – $3999 ☐4 $4000 – $5999 ☐5
$6000 – $7999 ☐6 $8000 – $9999 ☐7 $10000 – $19999 ☐8

23 Do you intend to buy software during 1981?
Yes ☐1 No ☐2

24 What is your total budget for software?
up to $49 ☐1 $50 – $99 ☐2 $100 – $199 ☐3 $200 – 499 ☐4 $500 – $999 ☐5 over $1000 ☐6

25 Do you intend to buy blank cassettes during 1981?
Yes ☐1 No ☐2

26 Do you intend to buy disks during 1981?
Yes ☐1 No ☐2

27 Do you intend to buy computer stationery during 1981?
Yes ☐1 No ☐2

28 Do you intend to buy computer books during 1981?
Regularly ☐1 Occasionally ☐2 None ☐3

29 What do you use your micro for (please tick the *main* use only)?
Home use/games ☐1 Business ☐2 Scientific/Engineering ☐3 Education ☐4

30 Apart from yourself, how many other people read your copy of APC? ______

31 Do you object to your name and address being placed on a mailing list:
For APC use only Yes ☐1 No ☐2
For other commercial users Yes ☐1 No ☐2

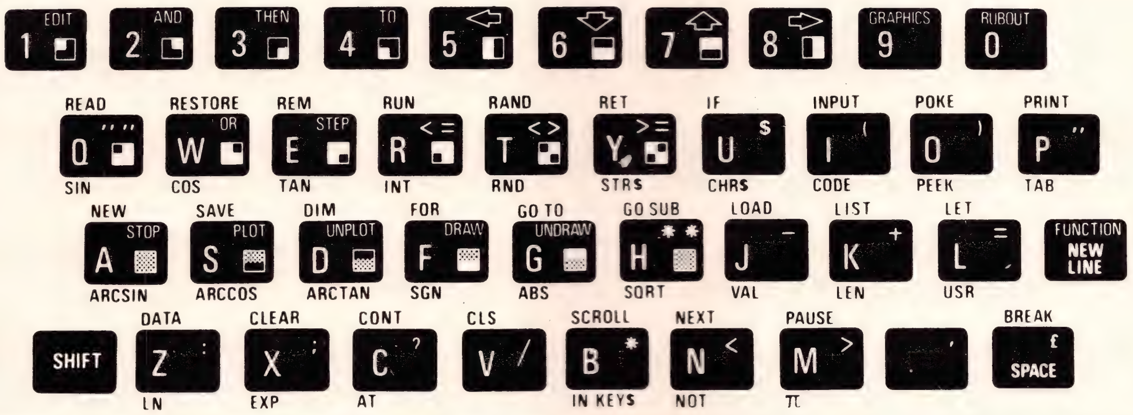
Thank you for taking part in our survey. The draw will take place in mid-December and the winners will be announced in our January edition. Please cut out this page and send to: Readers' Survey, APC, P.O. Box 115, Carlton, Vic. 3053.

Ingersoll

ZX80

8K BASIC ROM

Fantastic new options for sinclair ZX80



THE CHIP a drop-in replacement for the existing 4K BASIC ROM, comes with a new keyboard template and a supplementary operating manual. Designed for high-level, full facility computing.

KEY FEATURES INCLUDE —

- Full floating-point arithmetic to 9-digit accuracy.
- Logs, trig, and their inverse functions, graph plotting facility.
- Animated displays using PAUSE n.
- Full set of string-handling facilities.
- n dimensional arrays, cassette LOAD and save with named programmes.

AND ZX80 16K-BYTE RAM PACK

Complete module designed to provide massive add-on memory capacity.

The 16K-BYTE RAM pack can be used for program storage or as a database. Yet it costs up to half the price of competitive additional memory.

Measuring 3 in × 3 in × 1.25 in approx., the RAM pack plugs into the existing expansion port on the rear of the Sinclair ZX80 via an edge connector. No additional power supply is needed.

SINCLAIR EQUIPMENT (AUSTRALASIA) PTY. LTD.
308-312 High Street, Kew, Vic., 3101. Tel. 861 6224.

SE3

IN STORE

AUSTRALIA'S MOST UP-TO-DATE BUYER'S GUIDE FOR MICROCOMPUTERS

Month by month, every effort will be made to keep In Store up-to-date and accurate. And that means APC will always be happy to hear from its readers of any errors, and additions that seem worthy of inclusion.

LIST OF ABBREVIATIONS

A – Assembler
A/D – Analog to Digital
B/W – Black and White
C – Cassette
cps – Characters per second
Doc – Documentation
E – Extensive
Ex – Extended
F/D – Floppy Disc
H – Hardware
I – Introductory
I/O – Input / Output
int – Interface
K/B – Keyboard
M/A – Macroassembler
N/A – Not Available
N/P – Numeric Pad
O/S – Operating System
P/P – Parallel Port
RAM – Random Access Memory
ROM – Read Only Memory
res – Resolution
S – Software
S/P – Serial Port
T/E – Text Editor
U – Utility
VDU – Video Display Unit

All prices shown are exclusive of sales tax, except where indicated by an asterix.

Software items listed in *italics* are not included in the basic price of the equipment.

Name of Machine	Main Distributor & Phone No	Hardware	Software	Doc	Price	Comments
Apple II plus	———	16-48K RAM: 6502: colour VDU int.: 81/O slots: games paddles: option 5¼" F/D (116K) and 11 MB disc	O/S: BASIC: *Pascal:* games	E	$1395	280x192 high res colour graphics: Applesoft BASIC in 12K ROM
Century	Abacus Computer Store (03) 429 5844	C100, 48-64K RAM: Z80: 12" VDU: 2x5¼" F/D (2x143K): 112 cps printer: RS232 port: S100 bus: C200 includes 2xF/D (2x315K): hard disc: 4xRS232: 2xP/P	*COBOL: FORTRAN: BASIC*	I	C100–$4950: C200–$5400	Also available: C300
Challenger IP	Systems Automation (02) 439 6477	4-32K RAM: 6502: C int: 24x32 VDU int: RS232 port: option – dual 5¼" F/D (140K)	O/S: BASIC: A: games	I	$448	8K microsoft BASIC in ROM: expansion board available
Challenger 4	Systems Automation (02) 439 6477	8-48K RAM: 6502: colour 32x64 VDU int: RS232 port: P/P: option – 6502C microprocessor; dual 5¼" F/D (140K)	BASIC: *Pascal*	I	$871	BASIC in 8K ROM
Compucolor II	Anderson Digital Equipment (03) 543 2077	8-32K RAM: 8086: 13", 32x64 8 colour VDU: single 5¼" F/D (51K): RS232 port	ExBASIC(ROM):*A*	I	$2095	16K model, $2395: 32K $2695: maintenance manual available
Cromemco System 2, System Z2H, System 3	–	64-512K RAM: Z80A: System 2, dual 5¼" F/D (346K): System Z2H, also Winchester disc (11MB): System 3, 8" dual 1MB: S/P: P/P	CDOS: *BASIC: COBOL: FORTRAN: M/A: ExBASIC: Structured BASIC*	E	System2 $3990 System Z2H $9650 System 3, $6750	All Systems expandable to multi user (2-7 users) $2880–$8825
Exidy Sorcerer Model II	Dick Smith Electronics (02)888 3200	8-48K RAM: Z80: 30x64 VDU int.: RS232 Port: P/P: S100 bus:extra C int.	O/S: ExBASIC (ROM): *M/DOS: CP/M*	I	$1295*	High res graphics capability: 16K version $1395*: 32K version $1525*: 48K version $1655*: User programmable character set
HP-85	Hewlett Packard Australia (03)89 6351	16-32K RAM: N/A: 5", 16x32 B/W VDU: C(200K): 64 cps printer: RS232 port: 4 x P/P	BASIC	S	$3550	Full dot matrix graphics: N/P: compact portable unit
IPS-100	Microprocessor Applications (03) 754 5108	32-896K RAM: 8085: 2 RS232 ports: S100 bus: dual 5¼" F/D (630K)	O/S: Ex BASIC: Ed: A: *CP/M: CBASIC: FORTRAN: COBOL*	E	$3750	
Industrial Micro Systems	S.I. Micro-computer Products P/L (02) 231 4091	32-64KRAM Z80A 5¼" F/D (170K) 2 x SP Optional to 100 M VDU $1250. P/P 8" F/D ditto but to 2400K	O/S CP/M BASIC Cobol Fortran Pascal	E	$2747 $4565	Multi terminal capability Interrupt driven 80 char x 24 lines Ditto x Hard Disk 24M up option.
Microengine	Daneva Control (03)598 9207 Abacus Computer Store for complete system (03) 429 5844	64K RAM: MCP 1600: 2 x RS232 ports: 2xP/P: Options – dual 5¼" F/D (Single or dble density); 8" F/D (single or dble density)	BASIC: Pascal: File Manager: U	E	$2995	Also available as board
National Panasonic JD800	The Computer Company (02) 436 1733	64K RAM; 2-4KPROM; 8085A; 3 RS232C ports; S/P &/or P/P; 2 x 8" F/D (500K); 1920 ch. green phosphor VDU;	PanaBasic, Interpreter, Microsoft Basic, Fortran, Cobol & Assembler	E	$9290	PF 1–15 & PE 1–6 function keys on all models
National Panasonic JD840	The Computer Company (02) 436 1733	64K RAM; 2–4K PROM; 8085A; 3 RS232C ports; 2 x 5¼" F/D (2.2 Mb) 1920 ch. green phosphor VDU;	Panabasic, Interpreter, Microsoft Basic Fortran, Cobol & Assembler	E	$10725	

IN STORE

Name of Machine	Main Distributor & Phone No	Hardware	Software	Doc	Price	Comments
National Panasonic JD700	The Computer Company (02) 436 1733	32–64K RAM; 2–4K PROM; 8085A; 3 RS232 ports; 2 x 5¼" (140K); 1920 ch. green phosphor VDU;	Panabasic, Interpreter, Microsoft Basic Fortran, Cobol & Assembler	E	$7850	
National Panasonic JD740	The Computer Company (02) 436 1733	64K RAM; 2-4K PROM; 8085A; 3 RS232 ports; 2 x 5¼" F/D (560K) 1920 ch. green phosphor VDU;	Panabasic, Interpreter, Microsoft Basic Fortran, Cobol & Assembler	E	$8550	Price depends on systems configuration
North Star Horizon	Melbourne Byte Shop (03) 568 4022 S.I.Micro-computer Products (02) 231 4091	32-64K RAM: Z80A: 5¼" F/D (170K): 2xS/P: 1P/P: optional – VDU ($1350); Quad density F/D	DOS: BASIC: *COBOL: FORTRAN: Pascal: CP/M: M/A*	E	$2695	
Pet 2001	Hanimex (02) 938 0400	8-32K RAM: 6502: C: 9" 25x40 B/W VDU: extra C Int: IEEE488 port	O/S: BASIC: *A*	I	8K$1199 16K$1859 32K$2249	Options – dual 5¼" F/D (353K), $2329: $109 for disc operating ROM
Sinclair ZX80	Sinclair Equipment (Australasia) Pty. Ltd. (03) 861 6224	1–16K RAM; 780–1; C int: T.V. int: full K/B 44 pin expansion port	4K BASIC in ROM	I	$295*	CPU is NEC 3.25 MHz version of Z80A
Sord M100 ACE III	Alliance Digital Corporation (02) 436 1600 Abacus (03) 429 5844	48K RAM: Z80: 24x64, 12" VDU: RS232 ports: 2x5¼" F/D (2x143K): S100 bus: 2 octave speaker: A/D Conv.: option–8 colour graphic controller ($1450)	O/S: Ex*BASIC FORTRAN*	I	$4500	M100 ACE IV – 8 colour graphics controller incl.
Sord M223	Alliance Digital Corporation (02) 436 1600 Abacus (03) 429 5844	64K RAM: Z80: 12" 24x80 VDU: 2xRS232 port: S100 bus: 5¼" F/D (350K)	O/S: *ExBASIC: FORTRAN: COBOL*	I	$7500	
System 80	Dick Smith Electronics (02) 888 3200	16K RAM; Z80; 500 bps C; 32 x 64 TV int.; 1 P/P	BASIC: *M/A; Fortran*	I	$615*	
TRS-80 Level 1	Tandy Electronics (02) 638 6633	4-16K RAM: Z80: C: 12" 16x64 B/W VDU	BASIC: Games: A	I	$699*	BASIC in 4K ROM: upgradable to Level 2
TRS-80 Level 2	Tandy Electronics (02) 638 6633	4-48K RAM: Z80: C:12", 16x64 B/W VDU: RS232 port: P/P	BASIC: *M/A: FORTRAN: COBOL*		$879*	16K machine includes N/P: 4-16K upgrade $320*: ($250* without N/P): max. config. $1169*: option – single 5¼" F/D (78K), (max of 4)
Vector Graphics System B	AJ & JW Dicker (02) 524 5639	64K RAM: Z80: Dual 5¼" F/D (630K): 12", 24x80 B/W VDU: S/P: 2xP/P	DOS: BASIC: A: CP/M: Ed	E	$6350	Graphics and numeric pad.
Versatile 4	Microprocessor Applications (03) 754 5108	32-56K RAM: 8085: 9", 24x80 B/W VDU: dual 5¼" F/D (630K): S100 bus: 2xRS232	MBASIC: MDOS (including T/E and A): *Version 4 MDOS AND BASIC: CP/M*	E	$5692	

SINGLE BOARDS

Acorn	Cottage Computers (03) 481 1975	1-8K RAM: 6502: EPROM socket: Hex K/B: C int: 8 digit LED display: up to 16 ports: options – Euro-card 64 way connector; VDU card; Full K/B card	½K monitor: *BASIC*	S&H	System1 $285: SystemII $1224: SystemIII (incl.a5¼" F/D), $2763	Universal interface card available.
Aim 65	Dwell Pty Ltd (02) 487 3111	1-4K RAM: 6502: 8K ROM: full K/B: 20 character LED display: 20 character thermal printer: Cx2 int: 1 P/P	8K monitor in ROM: *A: BASIC*	E	$525*	Case available, $75*
SBC100	Microtrix (03) 718 2581	1K RAM: Z80: 8K ROM: S100 bus: 1S/P: 1P/P	1K monitor: DOS in ROM	E	$299	Also available assembled $374
Superboard	Systems Automation (02) 439 6477	4-32K RAM: 6502: 10K ROM: full K/B: 24x32 VDU Int: C int: options–RS232; dual 5¼" F/D (140K)	BASIC: games	I	$360	BASIC in 8K ROM

COMMUNICATION

Animistics

I read with fascination Neil Frude's article 'Animistics' (July APC).

While we are running barefoot rhrough the outer fringes of technology, how about a replacement of the blow-up female simulcra advertised in Playboy and such like. The blow-up doll market would collapse like a pricked balloon under the onslaught of a computer controlled responsive 'Randy Raquel'. Slot-in ROM pacs can cater for whatever perversion is your bag of beans and vocabulary pre-programmed from murmers to howls of appreciation.

You may not like the idea but to extend Frude's criteria of probability, 'there is money here, so no doubt they will be built'. No doubt readers will view it as prostitution of technology but this will not stop it (remember E = MC^2?).

This is not a new concept. Anyone remember a film called the Stetford Wives? Anyhow whatever the final outcome I am sure that it will give a new nuance to the phrase 'dolly birds'.

J. D. Swift.

Cheap screen

If there's one thing the average computer will give you it's a headache. Not the programming variety, but a genuine headache induced by peering for hours at a harsh white screen only inches from your eyes.

Solutions include sunglasses (which make the reading of magazines etc. rather difficult) and larger monitors further away.

A simpler and inexpensive solution is to trot down to your local garage and purchase a length of green plastic sheeting which can be cut to size and stuck onto your monitor (this sheeting is otherwise referred to as an anti-glare strip and is used on windscreens).

Easy on the eyes and not much strain on the pocket either.

F. G. Sturges.

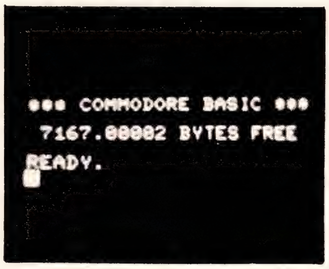
No Worries

A Mr Griffiths informs me that my concern expressed in last month's issue regarding the safety of connecting six power cords (required for operation of a Tandy business system) to one power outlet is unwarranted. He calculates a total of 500 watts are drawn – half that of a single bar radiator.

So you can safely eliminate the computer system from your short list of culprits when the fuses blow.

Dr Jon Patrick
Prahran C.A.E.

PET pranks



```
*** COMMODORE BASIC ***
 7167.00002 BYTES FREE
READY.
```

I thought you might like to see the enclosed photo of an 8k PET screen after power-on. It seems to prove that even micros have a sense of humour or perhaps it had just had a good night's rest previously. Anyway, I can deny it represents my efforts at getting a small foothold in the add-on memory business.

R D Eberst.

Ohio quickie

In response to your call for short programs, I'd like to offer the following for an Ohio Superboard:

```
1 S=5 3692+Y:
V=PEEK(S)=49 : POKE
S,49+V : Y=V–V*Y :
GOTO 1
```

Note that V=PEEK(S)=49 is not an error.

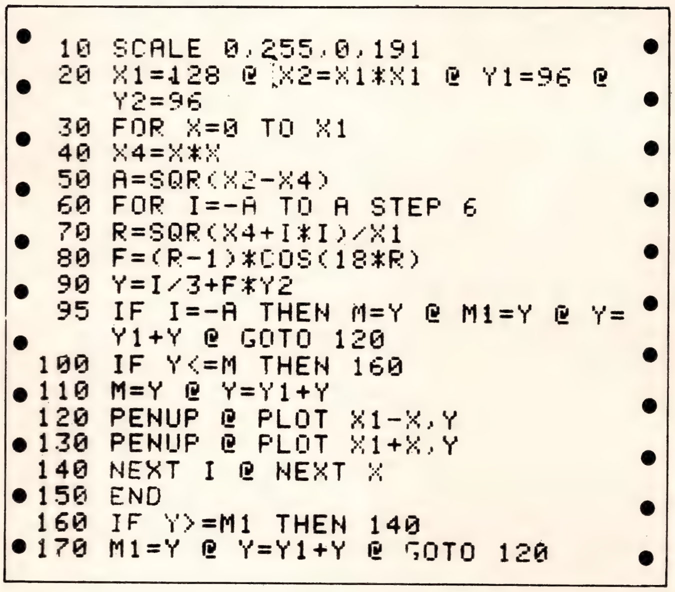
P. Smith.

We haven't tries this and we've no idea what it does, so you're on your own! Ed.

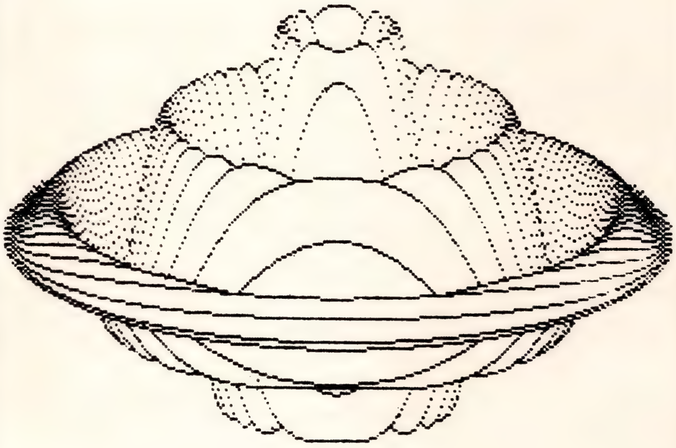
3D improvement

I was interested in Malcolm Banthorpe's article on 3-D plotting in your July issue. With slight modification, his program is very suitable for use on the HP85. It is possible, by adding a couple of lines, to show also the visible underside of the surfaces and this I believe improves the picture. Enclosed, with program listing, is an HP85 plot of a variant of his second figure, with visible underside shown.

Professor R H Macmillan.



```
 10 SCALE 0,255,0,191
 20 X1=128 @ X2=X1*X1 @ Y1=96 @
    Y2=96
 30 FOR X=0 TO X1
 40 X4=X*X
 50 A=SQR(X2-X4)
 60 FOR I=-A TO A STEP 6
 70 R=SQR(X4+I*I)/X1
 80 F=(R-1)*COS(18*R)
 90 Y=I/3+F*Y2
 95 IF I=-A THEN M=Y @ M1=Y @ Y=
    Y1+Y @ GOTO 120
100 IF Y<=M THEN 160
110 M=Y @ Y=Y1+Y
120 PENUP @ PLOT X1-X,Y
130 PENUP @ PLOT X1+X,Y
140 NEXT I @ NEXT X
150 END
160 IF Y>=M1 THEN 140
170 M1=Y @ Y=Y1+Y @ GOTO 120
```

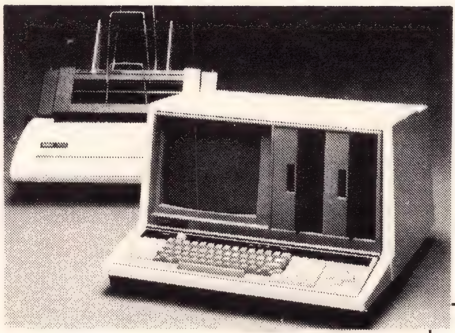


"This one is programmed to cheat so that you always have an excuse for losing."

EVERYBODY USES DIABLO PRINTERS — WHY NOT GO THE WHOLE WAY WITH A

DIABLO COMPUTER SYSTEM?

Fully integrated software — customised for each user, installed and supported.
Please contact us with your requirements and it will be our pleasure to submit a detailed proposal.

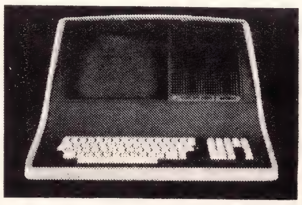


XEROX DIABLO 3000 with 8" DISKS

also larger DIABLO 3200

SUPERBRAIN™
BUSINESS SYSTEMS

Fully expandable — fixed disk, multi-user, terminals, printer options: IDS 440
Ti 810
Diablo Daisywheel



DEVELOPMENT SOFTWARE
- Basic interpreter
- Basic compiler
- Cobol
- Fortran IV
- Data Base/query
- Pascal
- TTY communications
- IBM 2780/3780.

BUSINESS SOFTWARE
- Debtors
- Creditors
- General Ledger
- Invoicing, stock and order entry
- Wages and payroll
- Word processing
- Direct mail

WE ALSO DISTRIBUTE:
- **C.B.M. SYSTEMS** — with standard software.
- **APF HOME COMPUTERS.**
- **COMMODORE PET.**

HEWLETT-PACKARD CALCULATORS
Count on quality — use HP's

HP41C Calculator	$374 ($336)
HP41C Accessories:	
Card Reader	$273 ($245)
Printer/Plotter	$489 ($439)
Memory Modules	$56.40 ($49.10)
Application Packs	$56.40 ($49.10)
Solution Books	$15.70 ($13.60)
Thermal Paper	$7.50 ($6.50)
40 Mag Cards	$25.10 ($21.80)

HP34C, 210 steps	$192.50 ($173)
HP33C, 49 steps	$155 ($139)
HP33E, 49 steps	$117 ($105)
HP32E Sci/Stats	$91.50 ($82)
HP31E Scientific	$66 ($59)

Also HP97 HP29C, HP38C, HP38E, HP37E.

HP ONLY — POST FREE
(PRICE IN BRACKETS EXCLUDE TAX)

SPECIAL!
TEXAS Ti59 and
PCIDOC PRINTER
$510 ($450)
p&p $4 N.S.W.
$5 elsewhere
we stock
CASIO calculators

CALCULATOR AND COMPUTER DISTRIBUTORS
INCORPORATING EXCLUSIVE CALCULATORS & COMPUTERS
and ELECTRONIC CALCULATOR DISCOUNTS

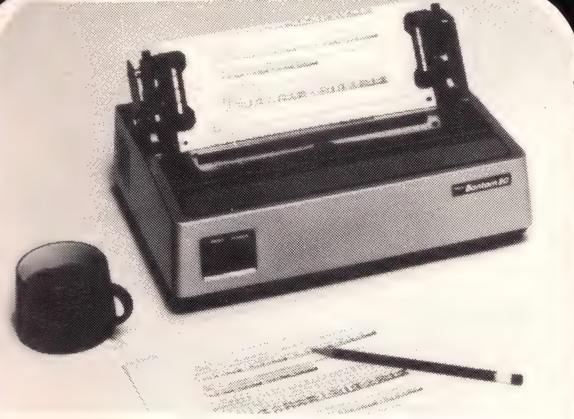
PHONE (02) 624-8849
MAIL ENQUIRIES
PO BOX 106, BAULKHAM HILLS
2153

ADE

THE PROFESSIONAL'S CHOICE

COMPUCOLOR II

MICROLINE 80



SPECIFICATIONS
- Integral Mini Disk Drive Standard
- Color Graphics on 128 x 128 grid
- Extended Disk Basic
- Eight colours (foreground and background)
- Up to 32 K/B user memory
- 8080 assembler available

APPLICATIONS
Education: Programmed learning
Small accounting or business systems
Process or control functions
A multitude of games available.

SPECIFICATIONS
- 80 cps 9 x 7 dot matrix
- Program selectable fonts
- Graphics
- 80-132 column printing
- 200,000,000 ch. head life
- full 96 ch ASC II Set

DEALER
ENQUIRIES
WELCOME

ANDERSON DIGITAL EQUIPMENT PTY. LTD.

THE VIABLE ALTERNATIVE

P.O. Box 322, MT WAVERLEY, VIC. AUST. 3149 Phone (03) 543 2077, P.O. Box 341, Thornleigh, N.S.W. AUST. 2120
Phone (02) 848 8533. Adelaide: 79 9211. Perth: 325 5722. Hobart: 34 4522. Brisbane: 350 2611. Darwin: 81 5760.
Canberra: 58 1811. Newcastle: 69 1625. Albury/Wodonga: (062) 2761. Barnawartha 129. N.Z. Wellington: 693 007.
Auckland: 87 6570. Christchurch: 79 6210. New Guinea Lae: 42 3924.

LEISURE LINES

Another good response – over 80 entrants – indicates that Puzzle 4 was not all that difficult (particularly for those of you with micros, programmable calculators, or use of OPCs – that's Other People's Computers).

In fact, I judge that the hardest part of the problem was actually fitting the answers onto a postcard, as requested; we even had one or two of the giant, home made variety.

The first correct entry selected out of the bag came from Elizabeth Bailey, Vermont; she will be receiving through the post, the promised bottle of Great Western Champagne. Her answers (which are not unique – in fact there is an infinite number of answers to each part of the question) are as follows: –

(a=2) 105263157894736842
(a=3) 1034482758620689655172413793
(a=4) 102564
(a=5) 102040816326530612244897959183673469387755
(a=6) 1016949152542372881355932203389830508474576271186440677966
(a=7) 1014492753623188405797
(a=8) 1012658227848
(a=9) 10112359550561797752808988764044943820224719

(I just hope the typesetter isn't too full of party spirit when this page is being set!)

THE QUICKIE

Okay, eyes down for a quick one (a real 'cringer", I'm afraid).
Two Australian coins add up to 55 cents. One is NOT a 50 cent piece. What are they?

PRIZE FOR THIS MONTH

Prepare yourself for Summer . . . for this month's lucky person there'll be a super large beach towel (male or female variety – depending on the gender of the winner).

PRIZE PUZZLE

This month's problem shouldn't prove too difficult. Find the smallest perfect square that is also the average of two other perfect squares. In other words, find three perfect squares –

a^2, b^2 and c^2 –such that: $\frac{b^2}{2}=a^2+c^2$

By the way, for all you smart alecs out there . . . a + b + c.

Answers please on a postcard to: Puzzle No. 6, Australian Personal Computer, P.O. Box 115, Carlton, 3053. All solutions must arrive by November 28 the latest.

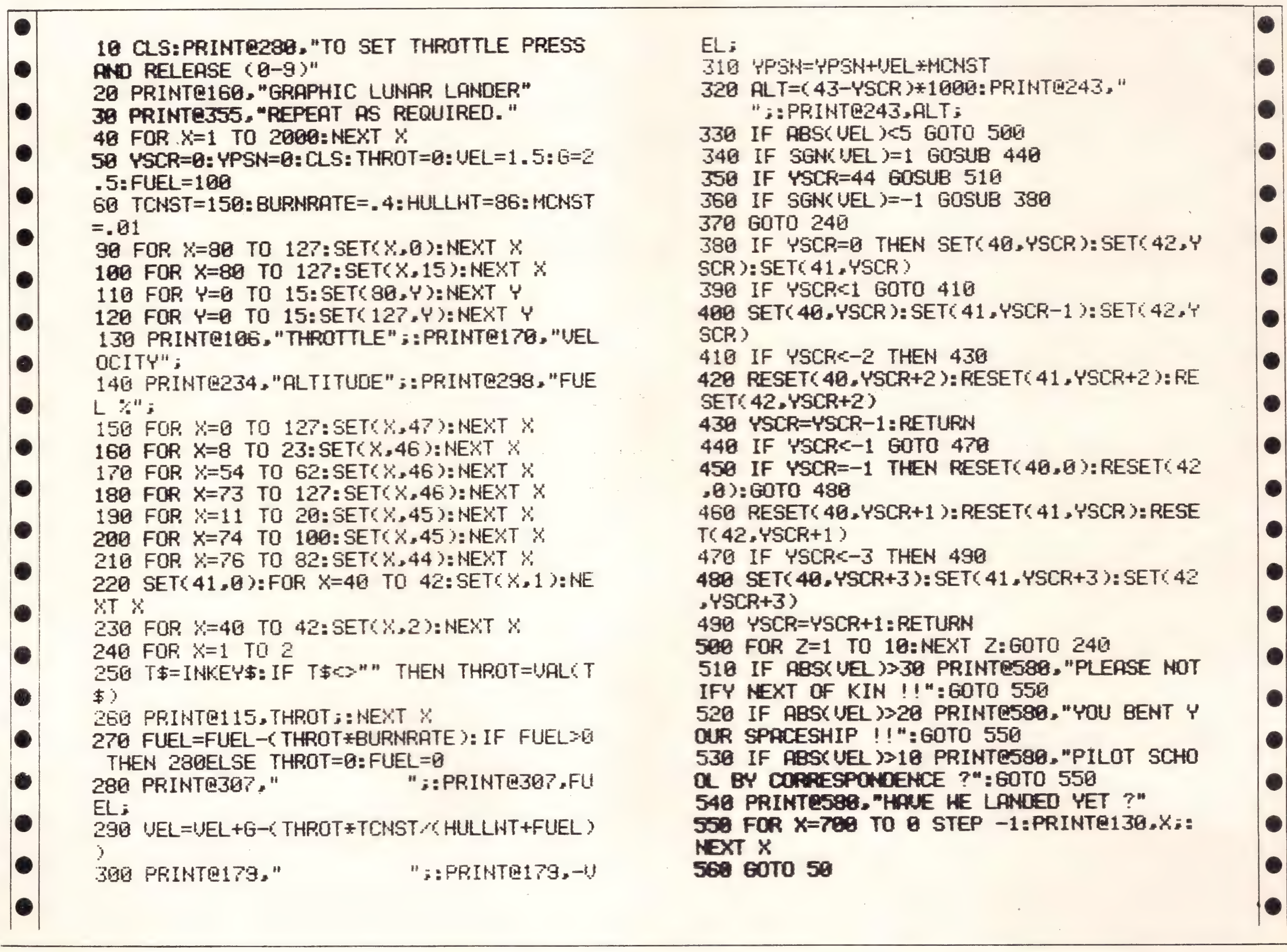
PROGRAMS

Lunar lander

by Tim Reeves

Graphically illustrated and a 'real time' simulation in Level II Basic, Lunar Lander will just fit into a 4K machine.

If the spacecraft descends too quickly for your liking, reduce the value of 'G' from its present 2.5 in line 50.

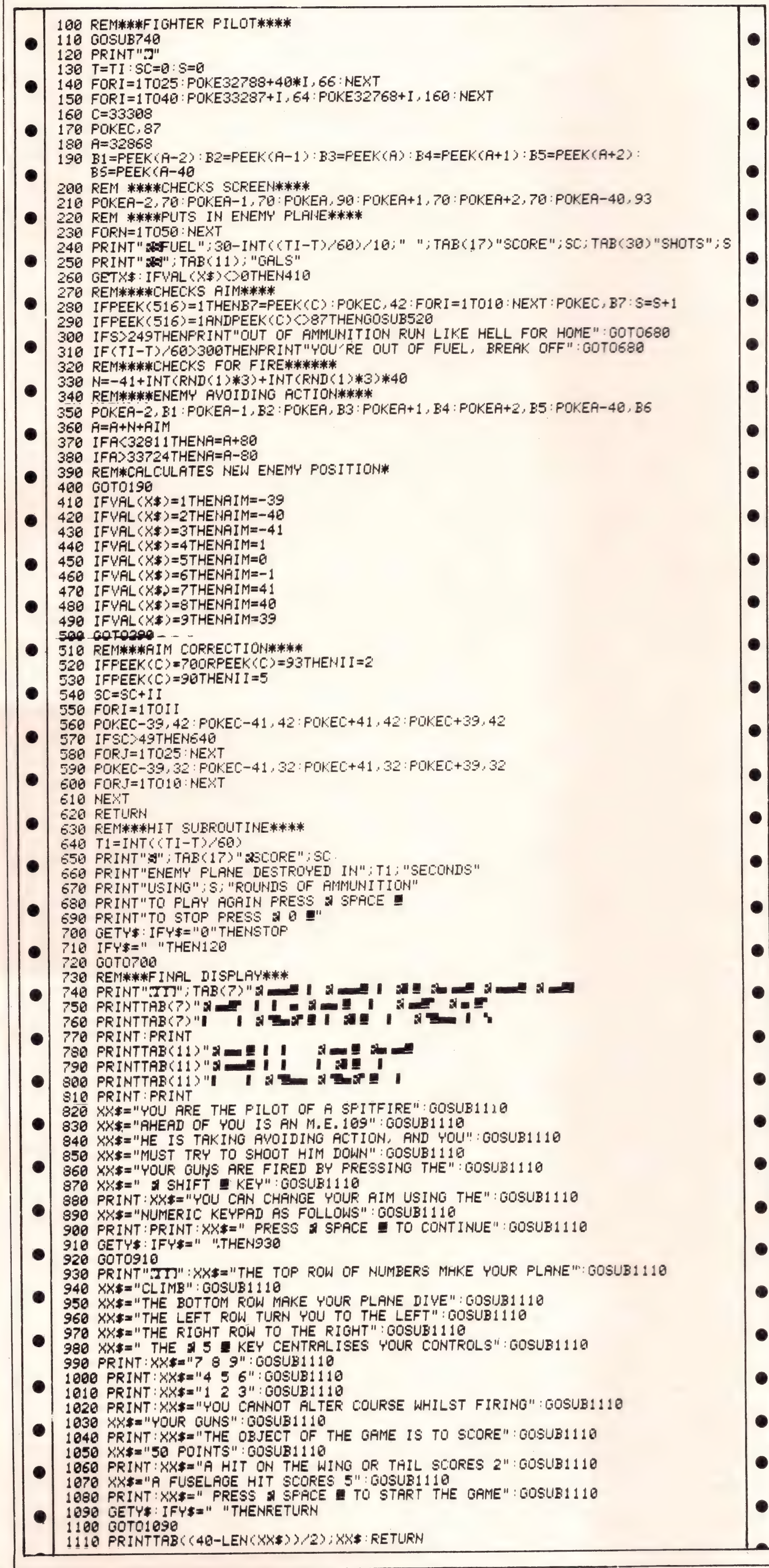


```
10 CLS:PRINT@280,"TO SET THROTTLE PRESS
AND RELEASE (0-9)"
20 PRINT@160,"GRAPHIC LUNAR LANDER"
30 PRINT@355,"REPEAT AS REQUIRED."
40 FOR X=1 TO 2000:NEXT X
50 YSCR=0:YPSN=0:CLS:THROT=0:VEL=1.5:G=2
.5:FUEL=100
60 TCNST=150:BURNRATE=.4:HULLWT=86:MCNST
=.01
90 FOR X=80 TO 127:SET(X,0):NEXT X
100 FOR X=80 TO 127:SET(X,15):NEXT X
110 FOR Y=0 TO 15:SET(80,Y):NEXT Y
120 FOR Y=0 TO 15:SET(127,Y):NEXT Y
130 PRINT@106,"THROTTLE";:PRINT@170,"VEL
OCITY";
140 PRINT@234,"ALTITUDE";:PRINT@298,"FUE
L %";
150 FOR X=0 TO 127:SET(X,47):NEXT X
160 FOR X=8 TO 23:SET(X,46):NEXT X
170 FOR X=54 TO 62:SET(X,46):NEXT X
180 FOR X=73 TO 127:SET(X,46):NEXT X
190 FOR X=11 TO 20:SET(X,45):NEXT X
200 FOR X=74 TO 100:SET(X,45):NEXT X
210 FOR X=76 TO 82:SET(X,44):NEXT X
220 SET(41,0):FOR X=40 TO 42:SET(X,1):NE
XT X
230 FOR X=40 TO 42:SET(X,2):NEXT X
240 FOR X=1 TO 2
250 T$=INKEY$:IF T$<>"" THEN THROT=VAL(T
$)
260 PRINT@115,THROT;:NEXT X
270 FUEL=FUEL-(THROT*BURNRATE):IF FUEL>0
 THEN 280ELSE THROT=0:FUEL=0
280 PRINT@307,"              ";:PRINT@307,FU
EL;
290 VEL=VEL+G-(THROT*TCNST/(HULLWT+FUEL)
)
300 PRINT@179,"              ";:PRINT@179,-V
EL;
310 YPSN=YPSN+VEL*MCNST
320 ALT=(43-YSCR)*1000:PRINT@243,"
    ";:PRINT@243,ALT;
330 IF ABS(VEL)<5 GOTO 500
340 IF SGN(VEL)=1 GOSUB 440
350 IF YSCR=44 GOSUB 510
360 IF SGN(VEL)=-1 GOSUB 380
370 GOTO 240
380 IF YSCR=0 THEN SET(40,YSCR):SET(42,Y
SCR):SET(41,YSCR)
390 IF YSCR<1 GOTO 410
400 SET(40,YSCR):SET(41,YSCR-1):SET(42,Y
SCR)
410 IF YSCR<-2 THEN 430
420 RESET(40,YSCR+2):RESET(41,YSCR+2):RE
SET(42,YSCR+2)
430 YSCR=YSCR-1:RETURN
440 IF YSCR<-1 GOTO 470
450 IF YSCR=-1 THEN RESET(40,0):RESET(42
,0):GOTO 480
460 RESET(40,YSCR+1):RESET(41,YSCR):RESE
T(42,YSCR+1)
470 IF YSCR<-3 THEN 490
480 SET(40,YSCR+3):SET(41,YSCR+3):SET(42
,YSCR+3)
490 YSCR=YSCR+1:RETURN
500 FOR Z=1 TO 10:NEXT Z:GOTO 240
510 IF ABS(VEL)>30 PRINT@580,"PLEASE NOT
IFY NEXT OF KIN !!":GOTO 550
520 IF ABS(VEL)>20 PRINT@580,"YOU BENT Y
OUR SPACESHIP !!":GOTO 550
530 IF ABS(VEL)>10 PRINT@580,"PILOT SCHO
OL BY CORRESPONDENCE ?":GOTO 550
540 PRINT@580,"HAVE WE LANDED YET ?"
550 FOR X=700 TO 0 STEP -1:PRINT@130,X;:
NEXT X
560 GOTO 50
```

PET Fighter Pilot

by E G Kemplen

Full instructions are in the listing.



```
100 REM***FIGHTER PILOT****
110 GOSUB740
120 PRINT"⊐"
130 T=TI:SC=0:S=0
140 FORI=1TO25:POKE32788+40*I,66:NEXT
150 FORI=1TO40:POKE33287+I,64:POKE32768+I,160:NEXT
160 C=33308
170 POKEC,87
180 A=32868
190 B1=PEEK(A-2):B2=PEEK(A-1):B3=PEEK(A):B4=PEEK(A+1):B5=PEEK(A+2):
    B5=PEEK(A-40
200 REM ****CHECKS SCREEN****
210 POKEA-2,70:POKEA-1,70:POKEA,90:POKEA+1,70:POKEA+2,70:POKEA-40,93
220 REM ****PUTS IN ENEMY PLANE****
230 FORN=1TO50:NEXT
240 PRINT"▚▚FUEL";30-INT((TI-T)/60)/10;" ";TAB(17)"SCORE";SC;TAB(30)"SHOTS";S
250 PRINT"▚▚";TAB(11);"GALS"
260 GETX$:IFVAL(X$)<>0THEN410
270 REM****CHECKS AIM****
280 IFPEEK(516)=1THENB7=PEEK(C):POKEC,42:FORI=1TO10:NEXT:POKEC,B7:S=S+1
290 IFPEEK(516)=1ANDPEEK(C)<>87THENGOSUB520
300 IFS>249THENPRINT"OUT OF AMMUNITION RUN LIKE HELL FOR HOME":GOTO680
310 IF(TI-T)/60>300THENPRINT"YOU'RE OUT OF FUEL, BREAK OFF":GOTO680
320 REM****CHECKS FOR FIRE******
330 N=-41+INT(RND(1)*3)+INT(RND(1)*3)*40
340 REM****ENEMY AVOIDING ACTION****
350 POKEA-2,B1:POKEA-1,B2:POKEA,B3:POKEA+1,B4:POKEA+2,B5:POKEA-40,B6
360 A=A+N+AIM
370 IFA<32811THENA=A+80
380 IFA>33724THENA=A-80
390 REM*CALCULATES NEW ENEMY POSITION*
400 GOTO190
410 IFVAL(X$)=1THENAIM=-39
420 IFVAL(X$)=2THENAIM=-40
430 IFVAL(X$)=3THENAIM=-41
440 IFVAL(X$)=4THENAIM=1
450 IFVAL(X$)=5THENAIM=0
460 IFVAL(X$)=6THENAIM=-1
470 IFVAL(X$)=7THENAIM=41
480 IFVAL(X$)=8THENAIM=40
490 IFVAL(X$)=9THENAIM=39
~~500 GOTO280~~ - - -
510 REM***AIM CORRECTION****
520 IFPEEK(C)=70ORPEEK(C)=93THENII=2
530 IFPEEK(C)=90THENII=5
540 SC=SC+II
550 FORI=1TOII
560 POKEC-39,42:POKEC-41,42:POKEC+41,42:POKEC+39,42
570 IFSC>49THEN640
580 FORJ=1TO25:NEXT
590 POKEC-39,32:POKEC-41,32:POKEC+41,32:POKEC+39,32
600 FORJ=1TO10:NEXT
610 NEXT
620 RETURN
630 REM***HIT SUBROUTINE****
640 T1=INT((TI-T)/60)
650 PRINT"▚";TAB(17)"▚SCORE";SC
660 PRINT"ENEMY PLANE DESTROYED IN";T1;"SECONDS"
670 PRINT"USING";S;"ROUNDS OF AMMUNITION"
680 PRINT"TO PLAY AGAIN PRESS ▚ SPACE ■
690 PRINT"TO STOP PRESS ▚ 0 ■"
700 GETY$:IFY$="0"THENSTOP
710 IFY$=" "THEN120
720 GOTO700
730 REM***FINAL DISPLAY***
740 PRINT"⊐⊤⊐";TAB(7)"▚▬▬■ ▌ ▚▬▬■ ▌ ▚■ ▚▬▬■ ▚▬▬■ ▚▬■
750 PRINTTAB(7)"▚▬■ ▌ ▌ ▬ ▚▬▬■ ▌  ▚▬■ ▚▬■
760 PRINTTAB(7)"▌   ▌ ▚▬▬■■ ▌ ▚■ ▌  ▚▬▬ ▌ ▚
770 PRINT:PRINT
780 PRINTTAB(11)"▚▬▬■ ▌ ▌    ▚▬▬■ ▚▬■
790 PRINTTAB(11)"▚▬▬■ ▌ ▌    ▌ ▚■ ▌
800 PRINTTAB(11)"▌   ▌ ▚▬▬ ▚▬▬■■ ▌
810 PRINT:PRINT
820 XX$="YOU ARE THE PILOT OF A SPITFIRE":GOSUB1110
830 XX$="AHEAD OF YOU IS AN M.E.109":GOSUB1110
840 XX$="HE IS TAKING AVOIDING ACTION, AND YOU":GOSUB1110
850 XX$="MUST TRY TO SHOOT HIM DOWN":GOSUB1110
860 XX$="YOUR GUNS ARE FIRED BY PRESSING THE":GOSUB1110
870 XX$=" ▚ SHIFT ■ KEY":GOSUB1110
880 PRINT:XX$="YOU CAN CHANGE YOUR AIM USING THE":GOSUB1110
890 XX$="NUMERIC KEYPAD AS FOLLOWS":GOSUB1110
900 PRINT:PRINT:XX$=" PRESS ▚ SPACE ■ TO CONTINUE":GOSUB1110
910 GETY$:IFY$=" ".THEN930
920 GOTO910
930 PRINT"⊐⊤⊐":XX$="THE TOP ROW OF NUMBERS MAKE YOUR PLANE":GOSUB1110
940 XX$="CLIMB":GOSUB1110
950 XX$="THE BOTTOM ROW MAKE YOUR PLANE DIVE":GOSUB1110
960 XX$="THE LEFT ROW TURN YOU TO THE LEFT":GOSUB1110
970 XX$="THE RIGHT ROW TO THE RIGHT":GOSUB1110
980 XX$=" THE ▚ 5 ■ KEY CENTRALISES YOUR CONTROLS":GOSUB1110
990 PRINT:XX$="7 8 9":GOSUB1110
1000 PRINT:XX$="4 5 6":GOSUB1110
1010 PRINT:XX$="1 2 3":GOSUB1110
1020 PRINT:XX$="YOU CANNOT ALTER COURSE WHILST FIRING":GOSUB1110
1030 XX$="YOUR GUNS":GOSUB1110
1040 PRINT:XX$="THE OBJECT OF THE GAME IS TO SCORE":GOSUB1110
1050 XX$="50 POINTS":GOSUB1110
1060 PRINT:XX$="A HIT ON THE WING OR TAIL SCORES 2":GOSUB1110
1070 XX$="A FUSELAGE HIT SCORES 5":GOSUB1110
1080 PRINT:XX$=" PRESS ▚ SPACE ■ TO START THE GAME":GOSUB1110
1090 GETY$:IFY$=" "THENRETURN
1100 GOTO1090
1110 PRINTTAB((40-LEN(XX$))/2);XX$:RETURN
```

MICROMART

OPPORTUNITY

An excellent opportunity exists to join Sydney's latest and most go-ahead personal computer centre.

Applicants should have experience or a strong interest in microcomputers. The work will be varied and interesting, and salary will be negotiated according to age and experience.

Applications may be made in person to
P.A. Hatcher,
75 Castlereagh Street, Sydney
or in writing to
P.O. Box 4715, G.P.O. Sydney, 2001

COMPUTER BITS
for Apple, TRS-80, Compucolor, Scorcerer etc.
Disks $4.00 ($38.00 for 10)
16K Upgrades (200ns) $75.00
or $130.00 for 2
Apple lower case (Paymar) $75
Computer solutions courtesy:

17 Park Road,
Garden Suburb N.S.W. 2288
AUSTRALIA (049) 43 6805

FOR SALE
SORD M220
EXCELLENT CONDITION

64 Kb, 3 FDD's, cassette and 2 x RS232 interfaces, Journal printer and graphic keys. BASIC, assembler and Fortran.
DICK PREISS (03) 267 4822

Phd will be releasing a large range of Sensational Software – send for a free catalogue or see advertisement in next month's Australian Personal Computer.
P.O. Box 1107, Brunswick, Vic.

```
10 PRINT"TAPE EDITOR."
20 CLEAR 5000:DIM T$(100):REM. CLEAR NOT NEEDED ON PET.
30 NC=8:DIM CM$(NC):W1$="*TOP*":W2$="*END REACHED*"
40 CM$(0)="B":CM$(1)="F":CM$(2)="L":CM$(3)="D"
50 CM$(4)="I":CM$(5)="R":CM$(6)="SAVE":CM$(7)="S":CM$(8)="T"
60 INPUT"EXISTING FILE (Y OR N)";L$:IF L$="N" THEN 500
70 IF L$()"Y" THEN 60
80 MX=1:GOSUB 10000
90 GOSUB 6000:IF EF THEN MX=MX-1:P=1:GOSUB 7000:GOTO 110
100 T$(MX)=L$:PRINT L$:MX=MX+1:GOTO 90
110 INPUT"C";C$
120 FOR X=0 TO NC:IF CM$(X)=C$ THEN 140
130 NEXT X:PRINT"BAD COMMAND!":GOTO 110
140 ON X+1 GOSUB 170,200,230,260,310,290,340,370,480
150 GOTO 110
170 REM B-ACK
180 GOSUB 600:P=P-N:IF P(N THEN PRINT W1$:P=1
190 PRINT T$(P):RETURN
200 REM F-ORWARD
210 GOSUB 600:P=P+N:IF P(=MX THEN PRINT T$(P):RETURN
220 PP=MX:PRINT W2$:RETURN
230 REM L-IST
240 GOSUB 600:FOR X=P TO P+N:IF X)MX THEN P=MX:PRINT W2$:RETURN
250 PRINT T$(X):NEXT X:P=P+N:RETURN
260 REM D-ELETE
265 IF MX(1 THEN PRINT"CAN7T DO !":RETURN
270 IF P=MX THEN T$(MX)="":MX=MX-1:P=MX:PRINT W2$:RETURN
280 FOR X=P TO MX-1:T$(X)=T$(X+1):NEXT X:PRINTT$(P):T$(MX)="":MX=MX-1:RETURN
290 REM. R-ERLACE CURRENT LINE
```

```
300  PRINT "BY?";:GOSUB 1000:T$(P)=L$:RETURN
310 REM. I-NSERT AFTER CURRENT LINE
320 FOR X=MX TO P+1 STEP -1:T$(X+1)=T$(X):NEXT X
324 REM  MAKE NEXT 330
325 P=P+1:MX=MX+1:PRINT"INSERT":GOSUB 1000:T$(P)=L$:RETURN
340 REM. SAVE
350 GOSUB 9000:FOR X=1 TO MX:L$=T$(X):GOSUB 4000:PRINT L$:NEXT X
360 GOSUB 8000:PRINT"SAVE COMPLETED.":RETURN
370 REM. S-EARCH FOR
380 PRINT"SEARCH FOR":GOSUB 1000:F$=L$:IF F$="" THEN 380
390 IF P=MX THEN PRINT"CAN'T DO !":RETURN
400 FOR X=P+1 TO MX:L$=T$(X):GOSUB 2000
410 IF P8()0 THEN PRINT L$:P=X:RETURN
420 NEXT X:P=MX:PRINT W2$:RETURN
480 P=1:PRINT W1$:PRINT T$(1):RETURN:REM T-OP
500 PRINT"TYPE LINES, TERMINATED BY THE LINE:   END":MX=1
510 GOSUB 1000:IF L$="END" THEN MX=MX-1:P=MX:GOTO 110
520 T$(MX)=L$:MX=MX+1:GOTO 510
600 INPUT"FOR";N:IF N(0 THEN PRINT"ERROR!":GOTO 600
610 RETURN
1000 REM. SUBR. TO READ LINE OF TEXT FROM KEYBOARD TO L$
1010 INPUT L$
1020 RETURN
2000 REM. SUB TO DO   P8=INSTR(L$,F$)  (OFFSET=0)
2070 IF LEN(L$)(LEN(F$) THEN P8=0:RETURN
2090 FOR P8=1 TO LEN(L$)-LEN(F$)+1
2100 IF MID$(L$,P8,LEN(F$))=F$ THEN RETURN
2110 NEXT P8:P8=0:RETURN
3999 REM ******** TAPE I/O SUBS :- 4000,5000,6000,7000,8000,9000,10000
```

Apple plotting

by J J Clessa

Here's a relatively simple routine which enables you to plot a variety of mathematical functions using the Apple II.

The function should be input in polar form but don't worry if you don't know what that means — you'll soon get the hang of it by trial and error. Enter the function in line 200 and set the size control parameter A in line 10. Increase A to make the graph bigger or decrease A to make it smaller.

By experimenting with different functions and different values of A, you'll be able to create a variety of interesting curves. You might like to try these for starters:

R = A*(1–COS(T)) (A=50)
R = SQR(A*A*COS(2*T)) (A=100)
R = A (A=50)
R = A/T (A=150)
R = A*(1+2*COS(T)) (A=25)
R = A*SQR(TAN(2*T)) (A=50)
R = A*LOG(T) (A=20)
and for the romantic,
R = A*(COS(T–1.57) ∧ 9–2) (A=25)
while for something different try,
R = A*LOG(T/A)
(I've forgotten the A value for this last one so you'll have to experiment with it.)

The program calculates and plots the function of a range of T from 1^0 to 360^0. A FOR. . .NEXT loop isn't used because of the Apple's ONERR feature, which is necessary here for functions which produce negative square roots and the like.

I'd be pleased to hear of any interesting shapes you discover.

```
1  ONERR  GOTO 300
10 A = 25
100 X9 = 135:X1 =  - X9:Y9 = 75:Y1 =  - Y9
110 T1 = 1 / 3.1415926:T9 = 360 * T1:T0 = T1
120  HGR : HOME : HCOLOR= 3: VTAB (24): LIST 200
130  HPLOT X9,1 TO X9,2 * Y9: HPLOT 1,Y9 TO 2 * X9,Y9
190 T = T1
200 R = A *  LOG (T / A)
210 X =  INT (R *  COS (T)):Y =  INT (R *  SIN (T))
220  IF X < X1 THEN 270
230  IF X > X9 THEN 270
240  IF Y < Y1 THEN 270
```

```
250  IF Y > Y9 THEN 270
260  HPLOT X + X9,Y + Y9
270 T = T + T0
280  IF T <  = T9 THEN 200
290  STOP
300 E1 =  PEEK (222)
310 E2 =  PEEK (218) +  PEEK (219) * 256
320 T = T + T0
325  IF E1 <  > 53 THEN 340
330  RESUME
340  PRINT "ERROR CODE ";E1;" AT LINE ";E2
350  STOP
```

Lprint to print utility

This utility directs output from the lineprinter to the monitor (or vice versa) of your TRS-80 Level II. Just load or type it in and run it prior to execution of the program which is sending all that info. to the wrong place – and possibly hanging up your system.

```
20 A$=INKEY$:IF A$="" THEN 20 ELSE A=VAL
(A$)
25 ON A GOTO 30,40,50
30 POKE16422,88:POKE16423,4:NEW
40 POKE16414,141:POKE16415,5:NEW
50 POKE16422,141:POKE16423,5:POKE16414,8
8:POKE16415,4:NEW
```

```
2 CLS
4 PRINT"          LPRINT TO PRINT  OR  PR
INT TO LPRINT UTILITY"
10 PRINT:PRINT:PRINT"PLEASE INDICATE DES
IRED MODIFICATION :-":PRINT
12 PRINT"LPRINT TO PRINT ------ TYPE 1
14 PRINT"PRINT TO LPRINT ------ TYPE 2
16 PRINT"NORMALIZE       ------ TYPE 3
```

Have a peek....

Just a selection of books available from Australia's largest range of computer literature.

Microcomputers for Business Applications (Barden)	$11.95
6502 Software Gourmet & Cookbook (Scelbi)	$16.80
PET-CBM Personal Computer Guide (Donahue)	$20.50
Introduction to the Computer (Fuori)	$12.95
6502 Assembly Language Programming (Leventhal)	$19.20
Data Processing with Applications (Condon)	$17.95
Microcomputers/Microprocessors: Hardware, Software & Applications (Hilburn)	$30.50
Minicomputer Systems (Lines)	$26.95
Microprocessors: Technology Architecture and Applications (McGlynn)	$19.00
Microprocessors & Microcomputers (Tocci)	$22.95
Handbook of Microprocessors, Microcomputers & Minicomputers (Lenk)	$24.25
Microcomputers: A Technology Forecast & Assessment to the Year 2000 (Wise)	$22.35
The Art of Digital Design (Winkel)	$33.75
Computers in Business (Sanders)	$9.75
Minicomputer Systems: Organisation, Programming & Applications (Eckhouse)	$30.95
Microprocessor Programming & Software Development (Duncan)	$34.95
Pascal: An Introduction to Methodical Programming (Findlay)	$15.00
Problem Solving Using Pascal (Bowles)	$14.25
Structured Walkthroughs (Yourdon)	
Managing the Structured Techniques (Yourdon)	$33.75
Structured Design (Yourdon)	$25.95
Distributed Micro/Minicomputer Systems (Weitzman)	$30.50
Structured Computer Organisation (Tanenbaum)	$16.95
8080A/8085 Assembly Language Programming	$16.20
Architecture of Microcomputers (Greenfield)	$33.75
Syntax of Programming Languages (Backhouse)	$27.75
Structured Analysis & Systems Specification (DeMarco)	$28.95
EDP Costs & Charges: Finance, Budgets & Cost Control in Data Processing (Cortada)	$33.75
Computer Organisation, Hardware/Software (Gorsline)	$26.95
Introduction to Data Processing (Popkin)	$19.95
Computer Power of the Small Business (Sippl)	$8.95
From Television to Home Computer (Robertson)	$21.80
Basic & The Personal Computer (Dwyer)	$15.95
Elementary Structured Cobol (Davis)	$18.85
A Guide to Fortran IV Programming (McCracken)	$20.95
Microprocessors & Microcomputers (Huggins)	$12.50
Minicomputers: Structure & Programming (Lewis)	$19.05
Microcomputer Primer (Waite)	$10.75
Microcomputer-Analog Converter, Software & Hardware Interfacing (Titus)	$12.95
Digital Circuits & Microcomputers (Johnson)	$25.75
Successful Data Programming System Analysis (Gildersleeve)	$22.95
Programming in Basic for Business (Bosworth)	$13.25
Structured Systems Analysis (Gane & Sarson)	$26.50
The 8086 Book (Rector& Alexy)	$22.50
Flowcharting & Basic (Edwards & Broadwell)	$12.95
Learning Basic Fast (DeRossi)	$10.95
TRS-80 Interfacing Book 1 (Titus)	$11.95
TEA: An 8080 — 8085 (Titus)	$11.95
Information Systems Through Cobol (Philippakis & Kazmier)	$13.90
The S-100 and Other Micro Buses (Poe & Goodwin)	$7.95
EDP Concepts Course (NCR)	$19.95
RPG & RPG II Programming Applied Fundamentals (Bux & Cunningham)	$22.95
Introduction to Pascal (Welsh & Elder)	$13.95
Basic Programming Primer (Waite & Pardee)	$11.95
8080 Software Gourmet Guide & Cook Book (Scelbi)	$14.20
Learning Level II (Lien)	$20.00
Computer Programming for the Complete Idiot (McCunn)	$9.95
Basic Programming: Self-taught (Seymour C. Hirsch)	$12.95
Introduction to TI Basic (Inman/Zamora/Albrecht)	$12.50
Programming the Z8000 (Mateosian)	$19.40
Programming the Z80 — 2nd Edition (Zaks)	$18.60
The Future with Microelectronics (Barron & Curnow)	$12.95
Z8000 Assembly Language Programming (Leventhal/Osborne/Collins)	$19.20
TRS-80 Disk and Other Mysteries (TRS-80 Information Series — Volume I) (Pennington)	$19.80
Australian Microcomputer Handbook	$20.00

McGill's Authorised Newsagency Pty. Ltd.

187-193 Elizabeth Street (Opp. G.P.O.), Melbourne, 3000.
Tel. 60 1475, 60 1505

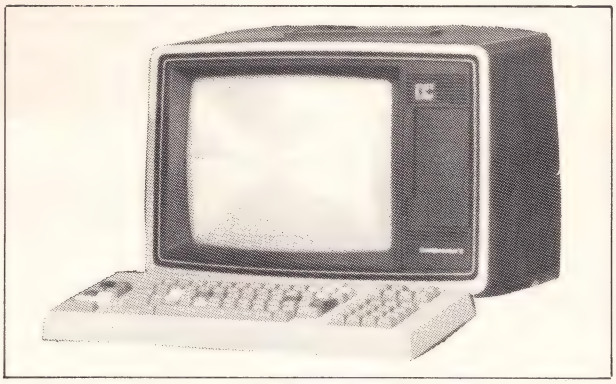
Mail Order Welcome. Credit card accepted. Postage: local $1.25, interstate $1.70

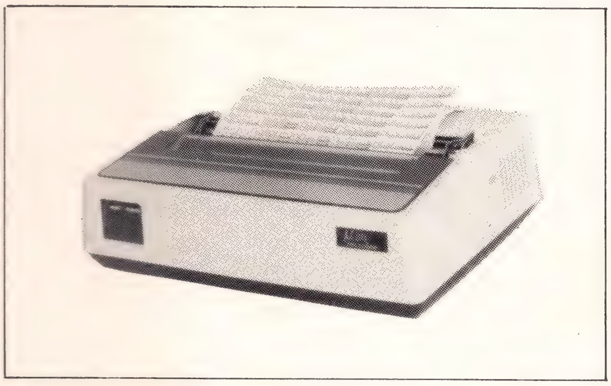
COMPUCOLOR II

MICRO COMPUTER

MICROLINE 80

IMPACT PRINTER





Features
- UP TO 32K USER RAM
- 5" DISK DRIVE
- 8 COLOUR VIDEO DISPLAY
- RS232C PRINTER PORT
- FULL GRAPHICS DISPLAY

Features
- FULL ASCII UPPER & LOWER CASE
- FULL GRAPHICS
- 80 CHARACTERS PER SECOND
- 9 x 7 DOT MATRIX
- 80 or 132 CHARACTER LINE

$ THE LOGIC SHOP PTY. LTD.

212 HIGH STREET, PRAHRAN, 3181 (03) 51 1950
91 REGENT STREET, CHIPPENDALE, 2008 (02) 699 4910

PROGRAMS

Star trek

written by Robert O'Connor

Some weeks ago, an extremely well written Star Trek program for a Level II 16K TRS-80 arrived at our office. As the program occupies 13K, the listing is too long to be published but we would like to make it available to readers of APC. So if you're interested send a (large) S.A.E. to Star Trek Listing, APC, P.O. Box 115, Carlton, 3053.

ZX80 Breakout

by K I Allsop

The aim is to remove a complete column of five bricks in as few attempts as possible. Brick removal is based on time because the screen is invisible while the ZX80 is thinking. Hit 'return' when you think it's time to fire the missile at the wall.

```
 10  LET F=0
 20  LET G=0
 30  DIM B(160)
 40  FOR A=1 TO 160
 50  LET B(A)=1
 60  NEXT A
 70  PRINT, “BREAKOUT”
 80  PRINT
 90  PRINT
100 FOR A=1 TO 160
110 IF A=F THEN PRINT “*”;
120 IF A=F THEN GOTO 150
130 IF B(A)=1 THEN PRINT “     ”;
140 IF B(A)=0 THEN PRINT “     ”;
150 NEXT A
160 FOR A=1 TO 32
170 FOR D=0 TO 4
180 LET E=A+D*32
190 IF B(E)=1 THEN GOTO 220
200 NEXT D
210 GOTO 320
220 NEXT A
230 LET G=G+1
240 POKE 16415,0
250 POKE 16414,0
260 INPUT A$
270 LET F=PEEK(16414)+ PEEK (16415)*256—4
280 CLS
290 IF F>160 THEN GOTO 350
300 LET B(F)=0
310 GOTO 70
320 PRINT “     ”
330 PRINT, “BREAKOUT”,G;“GOES”
340 INPUT W
350 PRINT “TIMEOUT”
```

Graph

by Ian O'Neill

This is a program written for the TRS-80 (with Level II Basic), which allows the user to plot any function y of x, which is expressible in the form y = f(x), eg. y = x*x + 2*x - 3. Unlike many other programs, however, this program asks the user for the equation of the curve during the run.

The program listed here is the most recent, Mark IV version of the GRAPH programs I have written. It is also a specially 'shrunk' version, so that users with 4K of RAM can also implement it on their systems, with no adaptation. Earlier versions, did contain full instructions within the program, which could be accessed at any time – if you have 16K (or more) memory.

As well as defining any function (in 'Cartesian' explicit form), the user may also choose his own x-axis and y-axis limits, or choose his x-axis limits and then type 'AUTO', which then causes the computer to calculate upper and lower limits for y. These values, are not, however, guaranteed; they are based on values taken between the two x-limits at thrice the normal interval. They may also be inaccurate if the function is discontinuous at the lower x limit (eg. y = 1/x at x = 0).

The Program

I managed to work out how the TRS-80's Level II Basic interpreter stores programs. It does so by searching each line as it is ENTERed, and converting any 'key words' into a single character, in the range 128–255 (ASCII code). Since these are characters which cannot be typed at the keyboard, they are 'free' for this use, and any key word, such as PRINT, or RETURN, or CLEAR, can be stored as just one byte, instead of 5, 6 or 5 respectively. The codes for certain functions can be seen in line 40.

By examining the function that the user types (stored in string T), and converting the key words into their respective codes, the program produces a version of the formula which, if it were stored as a line of the program, the computer could use. The next step is to put this converted formula into a (purposefully) vacant line, line 500, which is full of '@' characters before the program is run. The computer looks through its memory starting at byte number 19000 (since this is convenient), and using the Basic function PEEK, examines each byte until it comes across one with an '@' in it. Then, if the following four bytes are also '@' (character 64), the computer has located the dummy line, and stores the address of the first byte of the line in the integer variable L. Later, using the command POKE, it can store the translated version of the formula in line 500, followed by a :REM, so that the rest of the line (still full of '@'s) is ignored.

The program itself is composed as follows:

Lines 10–30 finds dummy line 500;
40 stores functions and their Level II codes in arrays V & R;
50–100 gets function from user, converts, and pokes into 500;
110 asks if function is symmetric about y = 0, eg. circle;
120–140 inputs limits, and checks their validity;
150–180 calculates automatic y limits (if requested);
190–270 control centre of program, which will process and act on a variety of single-character commands from the user;
280–340 plots graph of current function within current x and y limits;
350–360 error routine, for checking validity of formula, and location of discontinuities;
370 end of program – re-initializes line 500;
500–510 subroutine to calculate y given x – function stored in line 500 by program.

The program itself, in this 'compressed' form, occupies under 2400 bytes of memory; a further 400 bytes are reserved for string storage, and this leaves sufficient room for the storage of numeric variables, even on a 4K system.

Using the Program

When you run the program, the computer, after a slight pause while it locates line 500, will ask you to type the function, y, in terms of x. You may use any of the 5 arithmetic functions +, –, *, / and I, also parentheses,), (, any numeric constants, eg. 5, 3.141593, 1.41421E-06, (or function thereof), and any of the standard Basic library functions, ie. SGN, INT, ABS, RND, SQR, LOG, EXP, SIN, COS, TAN and ATN. The function should be typed in such a form that, were it typed as a line of a Basic program, it would be valid. Spaces may not be typed if the program is used as it stands without adaptation, nor any other characters not appearing above.

Once you have typed the function, you will be asked whether or not you wish the function to be symmetrical about the x-axis, to which you should answer "YES" or "NO" ("Y" or "N" will suffice). This allows, for example, for the plotting of conic sections. Incidentally, to plot a circle which looks like a circle requires a bit of 'fiddling' with the limits, or you end up with an ellipse!

The next stage is to type the limits. You must first type the lower and upper x limits, and then you will be asked for the lower y limit. You may type "AUTO"; if you do the latter, the computer will calculate its own y limits, and after a slight pause (whose length depends upon the complexity of the function), it will display these. If you type anything but "AUTO", however, the computer will take the value of whatever you type; so if you type "A" or any non-number, the computer assumes the value zero. If you do not request AUTO y limits, the computer will also ask for an upper y limit, of course.

Once you have typed limits, a flashing cursor will appear, indicating that you may now issue any of the following commands, simply by pressing the appropriate letter;

D Display limits (displays limits on top line of screen);
F display Function (again, on top line of screen);
L insert new Limits;
N New function (allows you to plot a different function);
P Plot (plots current function within current limits);
End program.

The last character is a top line shift character, so that it cannot be pressed accidentially. Depression of any other key will cause the computer to display a question mark(?) for a short time, to indicate that you have pressed a 'wrong' key.

Whenever you wish to cease using the program, you should terminate your usage via the "#" -key, as this way the computer pokes "@"s into line 500 again, so that the program can be run again straight away. If you leave the program by pressing the "break" key, however, the last function you used will remain resident in line 500, and if you attempt to run the program again, either the computer will miss line 500 altogether, or instead it will poke your new function into line 500 after the REM statement poked into line 500 by the previous run, and you will instead get graphs of the last function you typed on the previous run.

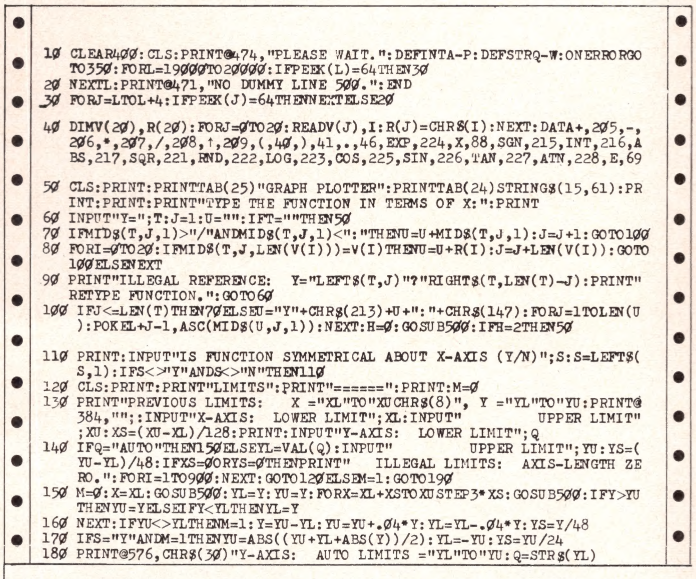
If you do break out of the program, you can change line 500 to its initial condition again manually, by editing line 500 and changing the first 5 or more characters into "@" characters, or by retyping line 500 altogether.

Note that, whenever you plot the function you are currently using, if either or both of the axes occur within the limits set, they will be plotted – this is done on lines 290 and 300, which can be removed if you do not want axes (or you would adapt the program to ask whether or not axes are required).

Finally, here are some graphs to try, if you're at a loss for ideas:

Y=SQR(X*X–1) (hyperbola) Yes to symmetry;
Y@SQR(1–X*X) (circle/ellipse) Yes to symmetry;
Y=SQR(X) (parabola) Yes to symmetry;
Y=SIN(X), Y=COS(X), Y=TAN(X), Y=ATN(X).
Y=1/SIN(X), etc. Y=1/X, Y=X 3, Y=EXP(X), Y=LOG(X)
Y=EXP(–.1*X)*SIN(X) try limits of x = 0 to 19, y = -1 to 1.
Y=(X–1)*(X–2)*(X–3)*(X–4) try x = .8 to 4.2, y AUTO.
and so on.

I. O'Neill

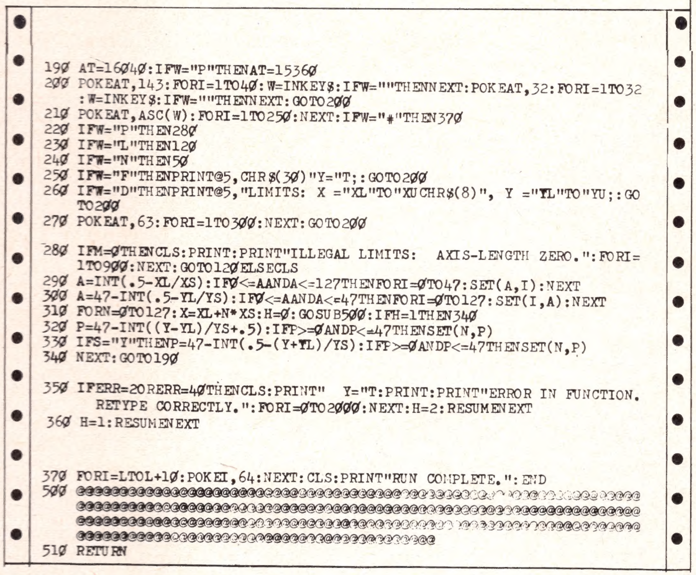


```
10 CLEAR400:CLS:PRINT@474,"PLEASE WAIT.":DEFINTA-P:DEFSTRQ-W:ONERRORGO
   TO350:FORL=19000TO20000:IFPEEK(L)=64THEN30
20 NEXTL:PRINT@471,"NO DUMMY LINE 500.":END
30 FORJ=LTOL+4:IFPEEK(J)=64THENNEXTELSE20

40 DIMV(20),R(20):FORJ=0TO20:READV(J),I:R(J)=CHR$(I):NEXT:DATA+,205,-,
   206,*,207,/,208,↑,209,(,40,),41,.,46,EXP,224,X,88,SGN,215,INT,216,A
   BS,217,SQR,221,RND,222,LOG,223,COS,225,SIN,226,TAN,227,ATN,228,E,69

50 CLS:PRINT:PRINTTAB(25)"GRAPH PLOTTER":PRINTTAB(24)STRING$(15,61):PR
   INT:PRINT:PRINT"TYPE THE FUNCTION IN TERMS OF X:":PRINT
60 INPUT"Y=";T:J=1:U="":IFT=""THEN50
70 IFMID$(T,J,1)>"/"ANDMID$(T,J,1)<":"THENU=U+MID$(T,J,1):J=J+1:GOTO100
80 FORI=0TO20:IFMID$(T,J,LEN(V(I)))=V(I)THENU=U+R(I):J=J+LEN(V(I)):GOTO
   100ELSENEXT
90 PRINT"ILLEGAL REFERENCE:  Y="LEFT$(T,J)"?"RIGHT$(T,LEN(T)-J):PRINT"
   RETYPE FUNCTION.":GOTO60
100 IFJ<=LEN(T)THEN70ELSEU="Y"+CHR$(213)+U+":"+CHR$(147):FORJ=1TOLEN(U
    ):POKEL+J-1,ASC(MID$(U,J,1)):NEXT:H=0:GOSUB500:IFH=2THEN50

110 PRINT:INPUT"IS FUNCTION SYMMETRICAL ABOUT X-AXIS (Y/N)";S:S=LEFT$(
    S,1):IFS<>"Y"ANDS<>"N"THEN110
120 CLS:PRINT:PRINT"LIMITS":PRINT"======":PRINT:M=0
130 PRINT"PREVIOUS LIMITS:   X ="XL"TO"XUCHR$(8)", Y ="YL"TO"YU:PRINT@
    384,"";:INPUT"X-AXIS:  LOWER LIMIT";XL:INPUT"          UPPER LIMIT"
    ;XU:XS=(XU-XL)/128:PRINT:INPUT"Y-AXIS:  LOWER LIMIT";Q
140 IFQ="AUTO"THEN150ELSEYL=VAL(Q):INPUT"          UPPER LIMIT";YU:YS=(
    YU-YL)/48:IFXS=0ORYS=0THENPRINT"  ILLEGAL LIMITS:  AXIS-LENGTH ZE
    RO.":FORI=1TO900:NEXT:GOTO120ELSEM=1:GOTO190
150 M=0:X=XL:GOSUB500:YL=Y:YU=Y:FORX=XL+XSTOXUSTEP3*XS:GOSUB500:IFY>YU
    THENYU=YELSEIFY<YLTHENYL=Y
160 NEXT:IFYU<>YLTHENM=1:Y=YU-YL:YU=YU+.04*Y:YL=YL-.04*Y:YS=Y/48
170 IFS="Y"ANDM=1THENYU=ABS((YU+YL+ABS(Y))/2):YL=-YU:YS=YU/24
180 PRINT@576,CHR$(30)"Y-AXIS:  AUTO LIMITS ="YL"TO"YU:Q=STR$(YL)
```



```
190 AT=16040:IFW="P"THENAT=15360
200 POKEAT,143:FORI=1TO40:W=INKEY$:IFW=""THENNEXT:POKEAT,32:FORI=1TO32
    :W=INKEY$:IFW=""THENNEXT:GOTO200
210 POKEAT,ASC(W):FORI=1TO250:NEXT:IFW="#"THEN370
220 IFW="P"THEN280
230 IFW="L"THEN120
240 IFW="N"THEN50
250 IFW="F"THENPRINT@5,CHR$(30)"Y="T;:GOTO200
260 IFW="D"THENPRINT@5,"LIMITS: X ="XL"TO"XUCHR$(8)", Y ="YL"TO"YU;:GO
    TO200
270 POKEAT,63:FORI=1TO300:NEXT:GOTO200

280 IFM=0THENCLS:PRINT:PRINT"ILLEGAL LIMITS:  AXIS-LENGTH ZERO.":FORI=
    1TO900:NEXT:GOTO120ELSECLS
290 A=INT(.5-XL/XS):IF0<=AANDA<=127THENFORI=0TO47:SET(A,I):NEXT
300 A=47-INT(.5-YL/YS):IF0<=AANDA<=47THENFORI=0TO127:SET(I,A):NEXT
310 FORN=0TO127:X=XL+N*XS:H=0:GOSUB500:IFH=1THEN340
320 P=47-INT((Y-YL)/YS+.5):IFP>=0ANDP<=47THENSET(N,P)
330 IFS="Y"THENP=47-INT(.5-(Y+YL)/YS):IFP>=0ANDP<=47THENSET(N,P)
340 NEXT:GOTO190

350 IFERR=20RERR=40THENCLS:PRINT"  Y="T:PRINT:PRINT"ERROR IN FUNCTION.
      RETYPE CORRECTLY.":FORI=0TO2000:NEXT:H=2:RESUMENEXT
 360 H=1:RESUMENEXT


370 FORI=LTOL+10:POKEI,64:NEXT:CLS:PRINT"RUN COMPLETE.":END
500 @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
    @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
    @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
    @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
510 RETURN
```

BLUDNERS

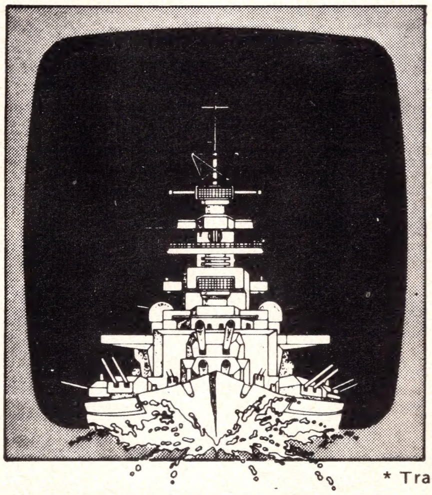
Just as we were patting ourselves on the back for a comparatively Blunder-free August issue, the September APC arrived. In case you hadn't noticed (and for the frustrated reader who rang up begging for a clue in the imagined 'spot the difference puzzle') pages 34 and 35 were identical. Anyone wanting a copy of the intended page 35, just drop us a line.

Pages 23 and 25 of Computer Games were somehow transposed; also make the following changes to Blinking Cursor in Tandy Tips: line 130 should read

FOR INDEX = 1 to 56

and line 210 should begin with DATA 229, not DATA 220.

WE MAKE THE BISMARCK COME ALIVE ON YOUR TRS-80*!



OR YOUR APPLE.

* Trade Mark of Tandy Corp.

MS Microsoftware proudly announce the Australian release of a true historical wargame for your home computer -- COMPUTER BISMARCK.™ It accurately simulates the epic battle between the awesome German battleship and the British Home Fleet . . . with you at the helm!

Available on cassette for TRS-80 16 and 32K Level II and on disc for Apple II 48K (Applesoft ROM). Both versions feature:

- Computer-controlled mapboard of the North Atlantic.
- Step by step computer-regulated play.
- Hidden movement.
- Ship vs. ship combat and shadowing.
- Historical setup of battleships, cruisers, and carriers.
- Firepower and damage.
- Two-player and solitaire scenarios.

The Apple Disc Version also features:

- Submarines, destroyers, and convoys.
- Land-based aircraft.
- Weather and fog.
- Fuel restrictions and refueling at sea.

TRS-80 Cassette Version: $59.95 **Apple Disc Version: $69.95**

To order today, send cheque or Postal Order to:

P.O. Box 119, Essendon, Victoria 3040.
MS Microsoftware, Beryl Street, West Essendon, Victoria

Please send a SAE, for further details of COMPUTER BISMARCK™ or the soon to be available, COMPUTER AMBUSH™.

COMPUTER BISMARCK™
There's never been anything like it.

If we are unable to process your order within fourteen days, your cheque or postal order will be returned.

ADVERTISERS INDEX

ASP Microcomputers . . . 45
Anderson Digital Equipment . . . 53
BS Microcomp . . . 16
C.I.S.A. . . . 11
Calculator Supermarket . . . 53
Computerland . . . IFC 2, IBC
Computerware . . . 34
Computer Country . . . 40
Dicker Data Systems . . . 43
Edible Electronics . . . 18
Electromedical Engineering . . . 16
Informative Systems . . . 10
K & L Computing Systems . . . 8
Logic Shop . . . 57
Looky Video . . . 18
MS Microsoftware . . . 22, 60
McGills Authorized Newsagency . . . 57
Melbourne House . . . 36, 37
Mensa Computer Systems . . . 6
Microcomputer House . . . 8
MicroPro Design . . . 4
micro Educational . . . 18
Peter Hatcher . . . 12, 13, 55
Phd Software . . . 55
Seahorse Software . . . 40
Sinclair Equipment (Australasia) . . . 7, 24, 25, 49
System Software . . . 40
TCG Ohio Scientific . . . OBC

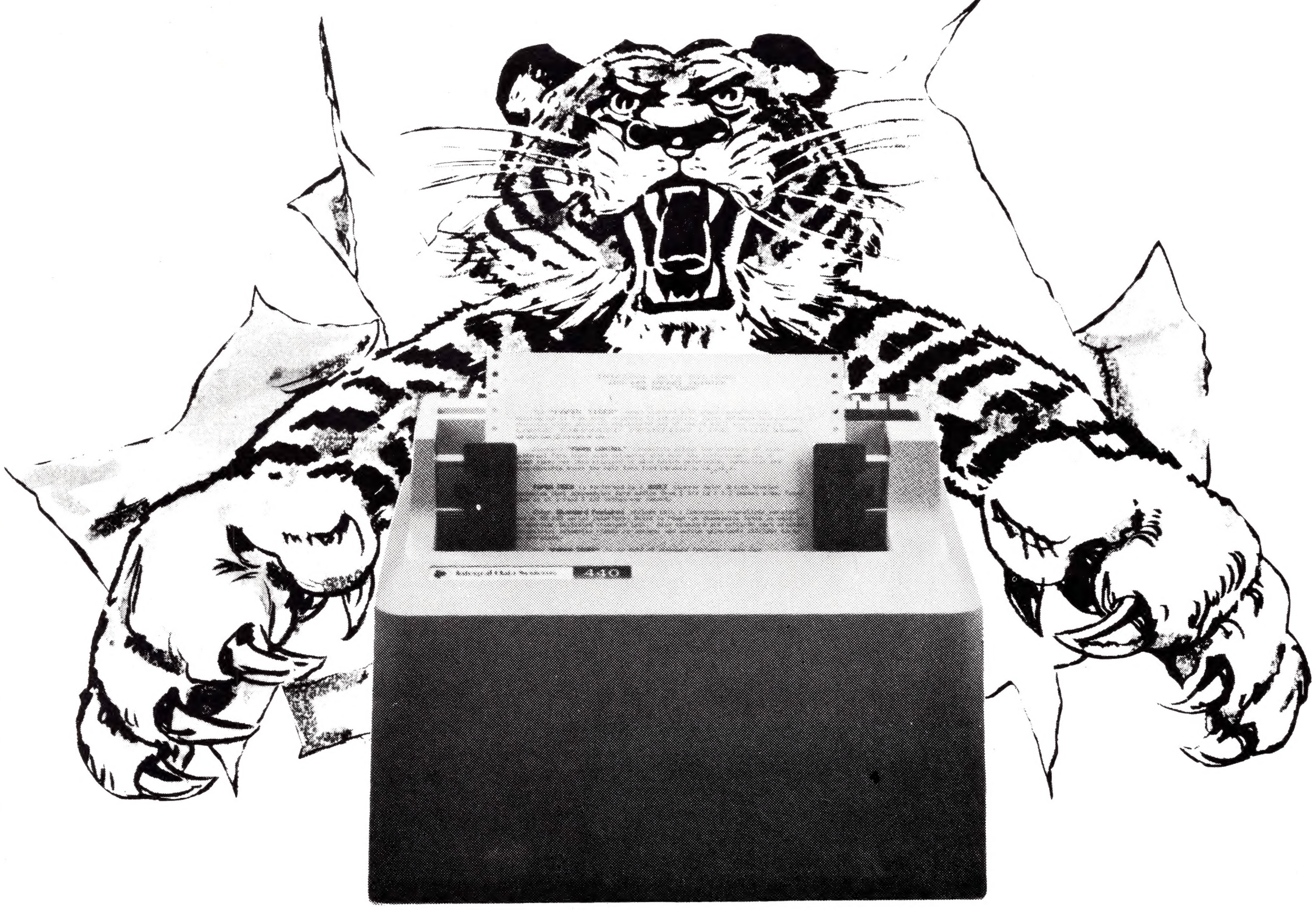
The Paper Tiger IDS440 Impact Printer

Puts more bite into everything you do.

Now available – the Paper Tiger Printer features a graphics option that lets you make the most of your Apple II or other personal computer. And, the Paper Tiger gives you 8 software-selectable character sizes, 80 and 132 column formats, Multi-Part business forms handling, adjustable tractor feed, form control, reliable stepper motor paper drive, serial and parallel interfacing . . . plus lots more.

Don't let our low prices fool you!

The Paper Tiger is rugged enough to stand up to the most demanding printer/plotter requirements.



We also stock:

TEXAS INSTRUMENTS: High speed, high reliability, professional dot matrix, 132 character/line printers.

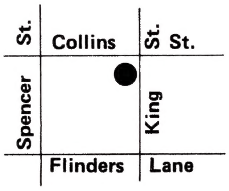
N.E.C.: Highest standard in professional character printers, for word processing and similar applications.

– AUSTRALIA'S LEADERS IN SMALL COMPUTER SYSTEMS –

write now or call us:

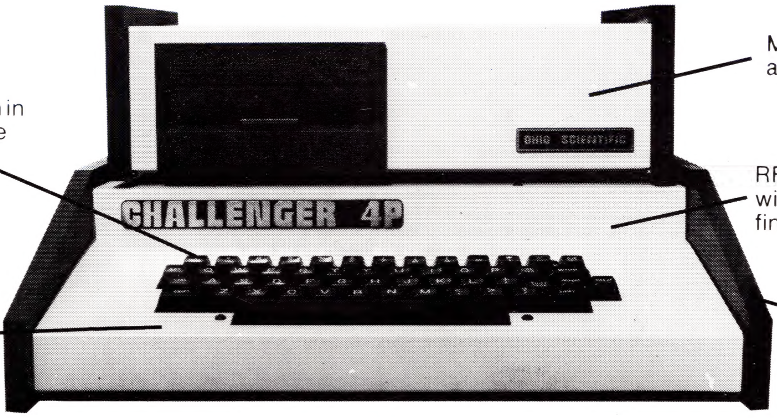
ComputerLand® in Melbourne

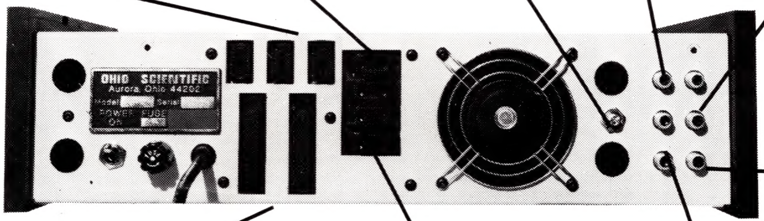
Grd. Floor, 555 Collins Street, MELBOURNE. VIC. 3000.
Phone (03) 62 6737 (03) 62 5581 Telex AA37007.



The Challenger 4

Whichever way you look at it, no other computer offers so much for so little, and in colour!


Full 53 key, keyboard which in polled mode can recognise up to 8 simultaneously depressed keys.
Minifloppy – two can be added.
RF shielded aluminium case with 2 step baked on enamel finish.
Inside: real time clock and countdown timer 24K memory 6502A processor
Solid oiled walnut sides.
CHALLENGER 4P
OHIO SCIENTIFIC


Control line interfaces, parallel lines for home security, accessory BUS, parallel I/O lines or other TTL signals.
Joystick sockets – add realism to games.
Colour adjustment.
Video Display 64 × 32
Sound outputs, programmable tone generators – 8 bit companding digital to analog convertors.
RF output for control of AC appliances.
Printer RS232 interface
Numeric key pad slots.
Cassette sockets.
OHIO SCIENTIFIC
Aurora, Ohio 44202

You'd have to go a long way to get better value in a computer. It has execution speed that really separates the computers from the toys. We think the Challenger 4 is way ahead of anything you've seen so far, for a wide variety of uses including business, personal, educational and games, as well as a real-time operating system, word processor and a data base management system.

The Challenger 4 has a 2MHz 6502 processor, and if that's not fast enough we can supply the GT option with the 6502C processor, and 120 nanosecond memory which averages over one million instructions per second.

A real time clock and count down timer, a 64 x 32 display in 16 colours, including 8K memory in the cassette version, 24K for the minifloppy. A BUS structure allows easy plug in of extra memory or many more OHIO boards. The BUS means modularity. If you bought your vintage C2-4 in 1977 we can change the boards at a much lower cost than a new computer.

For the best surprise of all ask our opposition if they can provide all these facilities. When they can't, ask us!

Special offer with this advertisement only — bring it along with you when you visit your dealer and obtain $20 discount off your CHALLENGER 4 purchase.

TCG

TOMORROWS TECHNOLOGY TODAY

OHIO SCIENTIFIC

LOCKWOOD TCG 4628

For more information and advice call on your local dealer to help you select the best system for your needs

AUSTRALIAN DISTRIBUTOR-TCG,
31 Hume St., Crows Nest, N.S.W. 2065

AUTHORISED AUSTRALIAN AGENTS

NEW SOUTH WALES

Bambach Elect. NEWCASTLE 2-4996

Compuserve Newcastle Pty. Ltd.
HAMILTON 61 2579

Hi-Fi Gallery TAMWORTH 66 2525

Macelec WOLLONGONG 29 1455

Micro Visions KINGSFORD 662 4063

Shoalhaven Communications
NOWRA (044) 24 444

J.G. Pearce Systems
DOVER HEIGHTS 789 4300

Unique Electronics
MERRYLANDS 682 3325

AUSTRALIAN CAPITAL TERRITORY

MES CANBERRA 82 1774

QUEENSLAND

Dialog BRISBANE 221 4898

SOUTH AUSTRALIA

Applied Data Control
FULLARTON 79 9211

K Tronics ADELAIDE 212 5505

TASMANIA

Eastside Computers
EAST DEVENPORT 27 8121

J. Walsh & Co. HOBART 34 7511

VICTORIA

Ellison Hawker Education Pty. Ltc
HAMPTON 598 9141

Pypher Data Systems
KEW 862 2122

WESTERN AUSTRALIA

Datas Comp. Acc. PERTH 381 36

Micro Data EAST PERTH 328 11

Micro Solutions SUBIACO 381 83